WORK

An Illustrated Magazine of Practice and Theory

FOR ALL WORKMEN, PROFESSIONAL AND AMATEUR.

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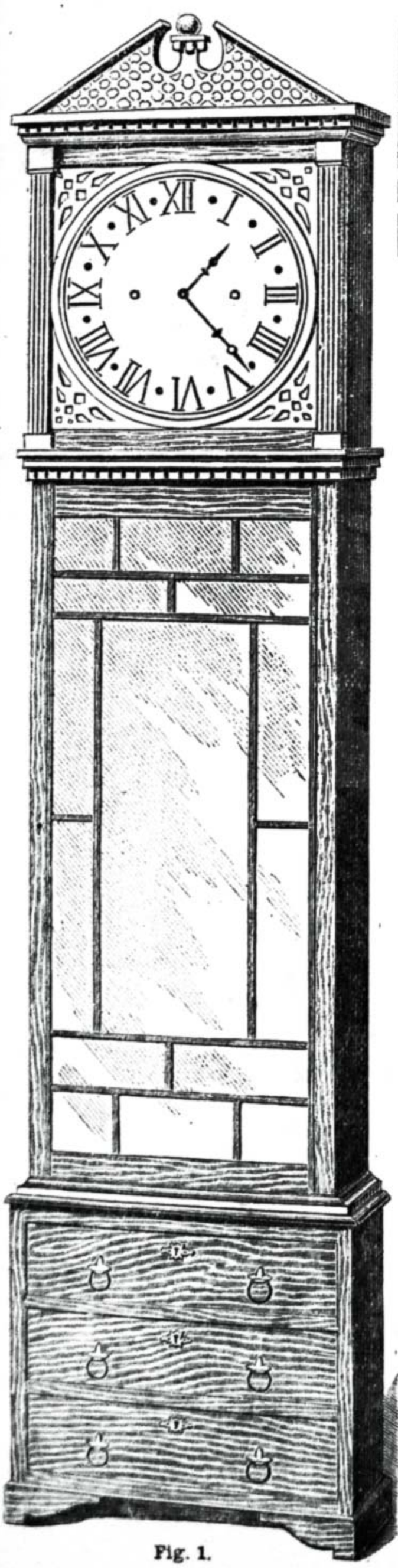

Fig. 1.

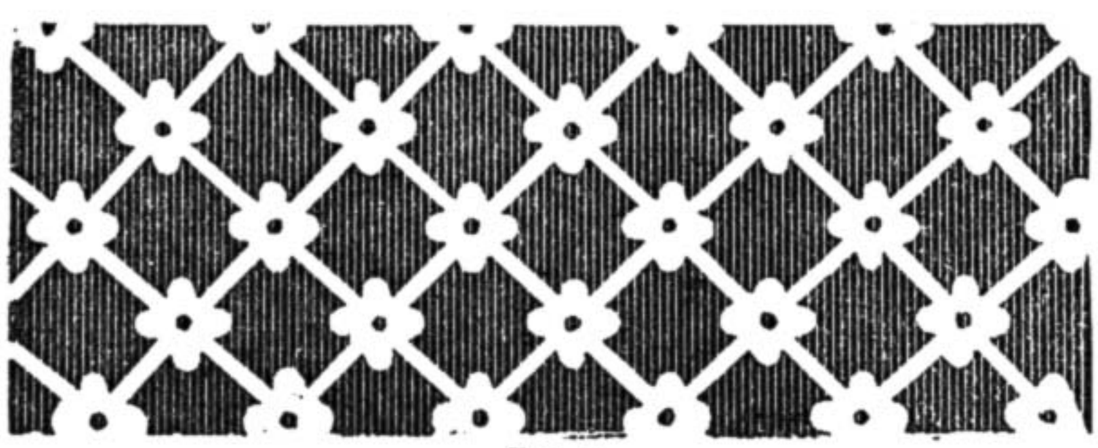

Fig. 2.

CLOCKS AND CLOCK-CASES.

BY E. BONNEY STEYNE.

I.—CABINET IN THE SHAPE OF A GRANDFATHER'S CLOCK.

THERE are a great many people who admire "grandfather clocks," and are yet without them. In this world the above statement with its substantive varied could be adapted to every conceivable object. But while many of the things we are without are beyond our means, or above our powers to acquire, if a substitute will do, there is no reason why any skilled craftsman should not "simulate" (to use a dressmaker's verb) the real thing—with an imitation that is at least tolerably honest.

For the idea of mounting the ordinary drum clock in a case modelled upon the old eight-day time-piece is preserved from dishonest pretence by its lower portion being obviously a cabinet and chest of drawers. To mount a cheap clock so as to suggest a costly one would be a blunder, because shams in that direction are indefensible. But while the taste of the design may be questioned, it hardly involves the sin of hypocrisy, since no clock with suspended weights and long pendulum could exist in company with a glass case for bric-à-brac, and a base filled with drawers.

Fig. 4.

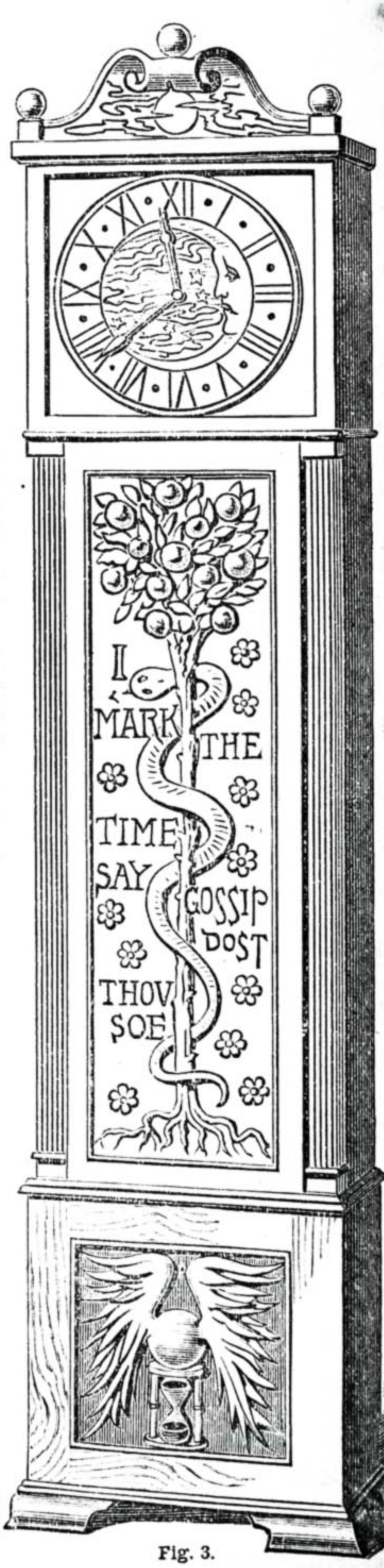

Fig. 3.

Fig. 1.—Stand for an Ordinary Eight-Day Drum Clock with Glazed Cupboard and Drawers. Fig. 2.—Detail of Ornament at Top of Fig. 1. Fig. 3.—Grandfather's Clock decorated in Gesso Work. Fig. 4.—Detail of Clock Face in Fig. 3

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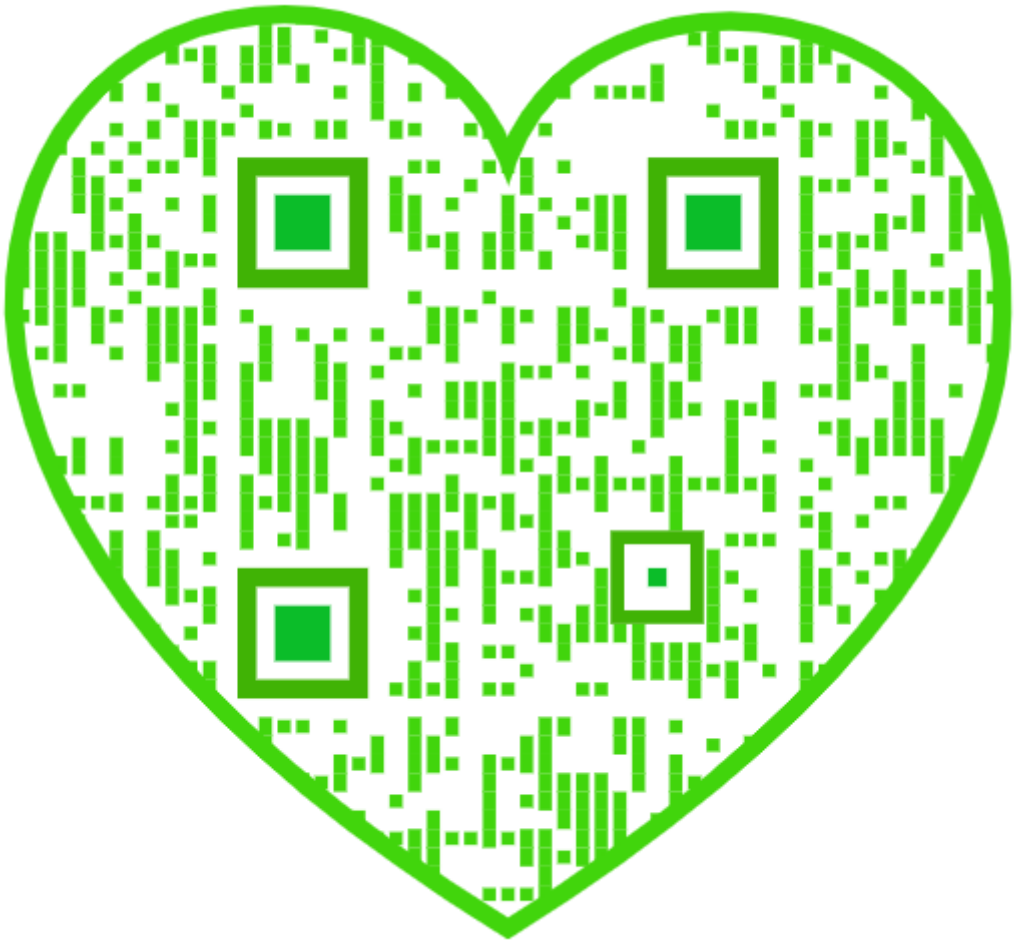

The decoration has been kept throughout of a quasi-Chippendale character. The front of the clock story does not open, as the face of the dial itself would of course be hinged. (I should explain that it is the ordinary clock, set in a mahogany turned frame one sees in shops, that I have in mind.) The upper portion, with its two fluted pilasters, its simple fretwork, and its turned finial, is clearly of the most commonplace order; yet I think not unpleasant, and effective in dark polished wood.

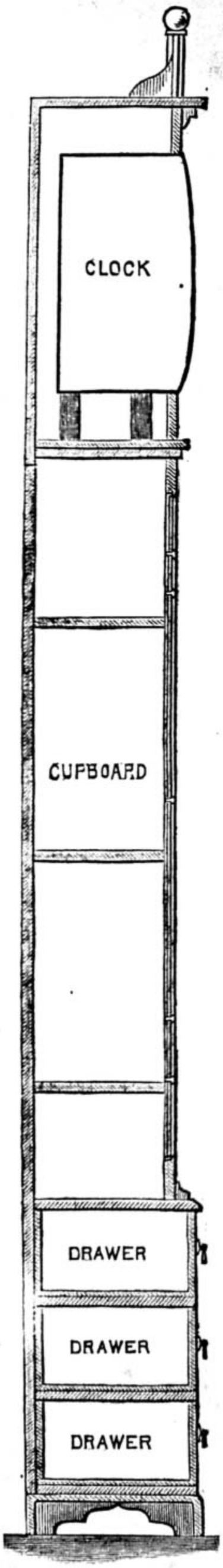

Fig. 5.—Section of Fig. 1

For the next story a door with simple framework for the glass is not absolutely out of harmony. Diamond-shaped framework, or tracery modelled on Gothic lines, such as Chippendale often used, would no doubt be preferable, but involve far greater skill in its construction.

The base—a chest of three drawers—is also commonplace, but useful, and helps to give the needful solidity to the structure.

The mouldings throughout are entirely of simple machine-made pattern, or else of the square fillets common to work of the period it follows.

Designed to be within the reach of any skilled workman, all the details have been kept as simple as possible. And while allowing more elaboration, it should, I think, be devoted to the enrichment of the drawer handles, escutcheons, and superior quality of wood, rather than in any mere ornaments. Inlay could be employed consistently, if not overdone.

The size is not given, because the diameter of the clock face governs the width of the design, and its height must be a matter of taste. The drawing shows an unusually high one, but the glazed story is so easily modified that any who desire to make it will find little difficulty in the adaptation.

As a clock of the sort it suggests projects farther than a hanging time-piece, in the section I have shown how the clock may be arranged without damage to its stability; but as it will be a little top-heavy, the lower part should be made rather weighty to avoid disaster.

II.—A Grandfather's Clock Decorated with Gesso Work.

Once upon a time every household that could afford to possess the stately old time-piece prized "the old clock on the stairs" as one of its most cherished heirlooms. Poets have sung of it, preachers have taken it as a text for the eternally true homily of the flight of time; and yet, despite singers and divines, it faded out of fashion, and was relegated to the kitchen or the lumber-room, or vanished no one knew or cared whither. The tendency to hark back to the days of Queen Anne set artistic folks rummaging. Once more the nobles who had sunk to the scullery or been kicked upstairs to the lumber-room were bidden to take their old posts of honour in the hall or in the drawing-room. The blue willow-pattern plates were rescued from the rack above the sink, and hung up in the drawing-room as deities to admonish their owners to shape their lives according to the precious sweetness of old blue and white. The brass candlesticks were robbed from the cook, and the kitchen fireplace mourned their loss, as they rose to the dignity of wax-candles, with elaborate arrangements in bougies and shades lavishly bestowed to heighten their splendour. The clocks, whether because of a fatally reiterated ditty, "Grandfather's Clock," supplying a new nickname, or because the new-old fashion in furnishing bade it, again reared their heads, and ticked as solemnly as ever. That the blue china improved the morals of the æsthetes, or that the old clocks made them more sensible of the importance of swift-flying time, is not yet known. Possibly historians of the eighteen-hundreds will trace subtle influence on its people from these and kindred sources; for history writers are people of fine invention and a class of "fictionists" not fully appreciated.

Of late the art of gesso has been revived; these columns have set forth its practice, and if the readers of Work are not experts in the art, it is possibly their own fault. But without knowledge of the actual work in its best examples, it is easy to under-rate this very beautiful recruit to the army of home-arts. Although but a late comer, the show of examples in the last exhibition of the Arts and Crafts Society, at the New Gallery, was second in interest to nothing in the show. The low relief-work, combined with rich lacquers in many-coloured metals, and vivid novel hues, revealed possibilities of splendour from comparatively inexpensive materials, that set all longing to commence experiments in gesso at once.

It has been urged against our unfortunate to-day that it has no style of its own, no school of decoration distinctly Victorian and English. In face of the work of Mr. William Morris and Mr. Walter Crane, the de Morgan tiles, the Whitefriars glass, the revived brass repoussé work, and dozens of other people and productions, it is hard to say that the style has not arrived. The people as a body are not educated enough to forswear base art, it is true; but to like better work, if only for trivial reasons of novelty and fashion, may—it is hardly safe to be too sanguine—lead the average person to dislike inferior work.

Among the gesso decorations were several clocks, and while it is impossible to reproduce either of the actual examples in this article, and the design given has little reason to be named in competition with their glories, an attempt is made in it to set clever brains to work for themselves and distance the example, set not so much for imitation as for suggestion. Next to a thoroughly worked-out plan, faultless and perfect, that can be followed exactly, a good bone of contention is most likely to lead to the required end. For if any one wishes to decorate a clock in gesso, he has probably thought out a scheme for its adornment, and will fail to be satisfied with this. But in spite of its time-honoured allegory, it may suggest an idea for suitable embellishment.

The motto from Mr. Austin Dobson's poem, "The Sundial," is apt enough for the purpose. The tree of Igdrasil, with the serpent, the tree of knowledge, with its twelve golden fruits, to typify the year, and the winged sun, the hour glass, the moon, and the winds, are all in keeping with the theme.

The gesso is intended to be coloured with various lacquers and shades. For instance, the fruit of the tree would be in orange-gold shaded to red, the leaves in many greens, the serpent in blue and green metallic lustre, the motto in plain gold letters.

The clock face would have a silver moon roughly suggesting a face, with drifting clouds of silver on a blue ground, the stars and some of the clouds being gilded in various shades of pale gold.

The ordinary form of clock is suggested in the drawing, as it is hardly likely any one would construct a case for the mere purpose of after decoration.

If in progress any hints are required, through the columns of "Shop" I shall be pleased to supply them.

A NEW SYSTEM OF MARINE SIGNALLING.

BY J. C. KING.

The flag-signal system in use in the British Navy, with many merits has conspicuous defects, chiefly due to atmospheric influences upon flags; one being the difficulty to read the signals when the flags are blown edge-ways, causing mistakes or delay; another the time taken to run up the flags, and it needing an expert to send or receive a message; another, interruption by fogs or darkness.

The system now brought under notice is the invention of Mr. R. J. Crowley, a capable officer of the United States Army, who was for nine years with the signalling staff.

The sketches and code now illustrated will easily explain the simplicity and effectiveness of the system, not only for the naval service, but for stations where signalling is available.

Fig. 1 is the apparatus ready for use; it consists of a metallic tube to be fixed to a maintop or station. This tube has eight arms standing horizontally from the tube, four on each side, in the same plane. On each of these arms is a shutter swinging on loops to the arms, operated by chains which reach to a stand in the maintop, or to the deck, or cabin. The motor of communication are four handles for manual operation. The signaller has a small board of the complete code in front of him to work from.

The code is alphabetical and numeral, and may be made a cipher-code if wanted.

For the alphabet, or numerals, any one who can spell English words, or add figures together, can work the code; send off and read off messages and signals, and, with practice, do it almost as quickly as by telegraph; so that messages are received or delivered at the same distances as the flag-signals now

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used, with unerring certainty. The operator or signaller has thirty signals, twenty-six for the alphabet to spell words, and four spare signals to tell if letters or numerals are to follow, "to wait," or to mark "an error."

Fig. 2 shows two of the signals in view, the staff holding them being turned to face the point signalled, to or from.

The eight shutters are painted with red and white vertical bands on one side, and a white star on a dark ground on the other side; these act so that the two shutters shown coming together form a large and distinctly marked signal.

The code, not given here, shows how thirty signals are made out of the fronts of eight shutters to form four reading fronts—either one, two, three, or four at once.

This arrangement makes the signals very conspicuous; and by a simple arrangement of single combinations, double combinations, cross-double combinations, and triple combinations, one of the easiest worked and simplest to be learned codes of signals

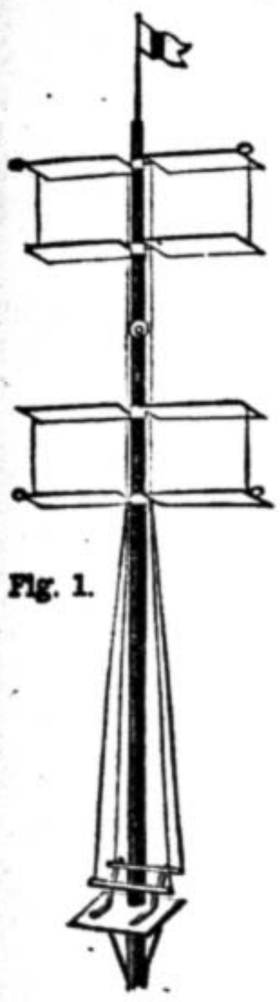

Fig. 1.

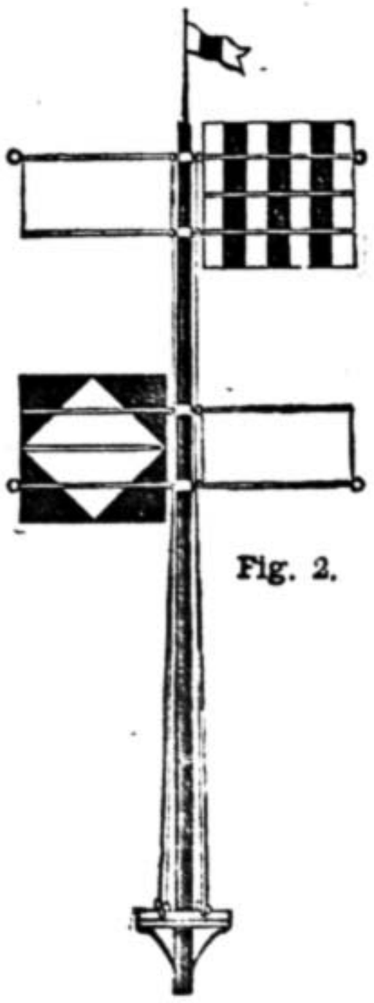

Fig. 2.

Fig. 1.—Apparatus ready for Work: "At Attention." Fig. 2.—Apparatus at Work.

that has ever been invented is now in use in the United States, and will be on trial by the British Government, as it has agreed to give the signals and code a trial at once.

The illustrations of the code of thirty distinct signals will enable any one to judge of its merits.

For night or fog-signalling, electric lights at the ends of the yards that carry the shutters have coloured glasses worked before them by the same four operating handles as for the shutters, the signals being number and interval flashes.

A large working model, with electric lights, in action, may be seen and tried any day at Messrs. Salter, Hunt & Co.'s, 62, King William Street, London, E.C.

CROSS-STAFF FOR DRAWING ELLIPSES.

BY JOHN WHITFIELD HARLAND.

THE illustrations (Fig. 1, plan; and Fig. 2, section) show a very useful cross-staff for drawing absolutely true ellipses of every size conceivable, and of every possible proportion that can occur. Whilst this means of describing ellipses is very old indeed, dating probably from the fifteenth or sixteenth century, several original improvements are now introduced for the first time, so far as I know, more particularly in the dividing of scales into English duodecimal parts at *a a*, and French decimals (centimètres and millimètres to "dixièmes"—that is, down to the thousandth part of a mètre or yard, which is supposed to be the ten-millionth part of the distance from the pole to the equator on the meridian of Greenwich) at *c c*, so that any decimal fraction that can he expressed in the proportion can be practically obtained with this little instrument, if accurately made. Construction:—Get some thin sheet brass about $\frac{1}{32}$ of an inch thick, and cut it to the size shown in the plan G G G G—*viz.*, $4\frac{3}{4}$ in. by $4\frac{3}{4}$ in. square, but with three corners rounded to a circular form with a radius of $2\frac{3}{8}$ in., the remaining corner being perfectly square at D, so that it may be placed square on the paper or board against a T or set square when required; or it may also be rounded off. Through the centre C draw two diameters E E, F F at right angles, one of which F F will be parallel to E D; and the other, E E, parallel to D F. The most exact accuracy is required in this. At E, F, E, F, cut with a graver a notch in the edge of the plate G G G G to enable you to place it exactly upon any given lines representing the major and minor diameters or axes of the required ellipse. Now plane up perfectly true and parallel a piece of dry mahogany or boxwood, $\frac{3}{8}$ in. wide, and $\frac{1}{4}$ in. thick, and about 23 in. or 25 in. long, to make the mitred pieces H, H (see section, Fig. 2), and set them exactly $\frac{3}{8}$ in. apart—*i.e.*, $\frac{3}{16}$ of an inch each side of your centre lines E E, F F, and having previously drilled holes *i, i, i, i* through the plate G G G G about the centres of where these pieces come and also countersunk them for the heads of $\frac{3}{8}$ in. wood screws, proceed to fix them to the plate from the back, one by one, with, say, three screws to each piece H, H (Fig. 2). Now take the piece of boxwood or mahogany, which will remain after sawing off your pieces H. H, and from it cut off two pieces S, S for slides —1 in. long. Into each, exactly at half the length—that is, $\frac{1}{2}$ in. from each end, and $\frac{3}{16}$ from each side—fix a steel pin going nearly through and standing up about $\frac{1}{4}$ in. These two pins may be made of No. 0 wood screws $\frac{3}{8}$ in. long, filed taper to a point after they are driven by cutting off their heads with a file and rounding them accurately; but if you have a lathe, by all means turn them out of a steel knitting needle softened in a candle or a gas jet, and cut on them a wood-screw thread. To insure great accuracy, I suggest as shown in the drawings the lines *a a, b b, c c, d d*. You should obtain a piece of printer's brass rule, 8 *to pica* (*i.e.*, the 48th of an inch) in thickness, and mitred so as to overlay, or overlap, the slides S, S a 32nd of an inch, filed down to $\frac{9}{16}$ wide, screwed down to the pieces H, H from the face with $\frac{3}{8}$ in. screws, countersunk for screw heads in three places in each at *j, j, j, j*, care being taken not to come opposite the screws *i, i, i, i* from the back (see dotted circles) and C, and fix the pieces H, H to the plate G G G G. Before fixing the four pieces A, A, B, B, or after fixing them, which is preferable, dismount them again in order to engrave or etch the two scales—*viz.*, the duodecimal and decimal scales.

Now, for the purpose of the utmost accuracy, as any error is magnified and multiplied, use the method of dividing shown in Fig. 4, the divisions of the line X Z being diagonally carried to the line X Y by parallel lines proportionately smaller on the principle of the diagonal scale which reduces the chances of error. A dividing machine would, of course, do this better still. To facilitate the measurement of the distances between the points *k, k*, construct on each side of the groove at *c c* and *a a* (as shown in plan, Fig. 1) scales, one of inches, eighths, and sixteenths; the other of centimètres and dixièmes—*i.e.*, one duodecimal; the other decimal. In order to do this with the least error, draw a line X Z at an angle to your scale line X Y, and divide it into equal spaces, as shown; then take an exact inch on the scale line X Y and join the 1 in. point with the eighth point on X Z, and with lines parallel to the line thus obtained at the 1 in. point in X Y you will get the $\frac{1}{8}$ in. scale very accurately along the space from X to 1 in.—*i.e.*, your inch will be divided with accuracy into eighths; proceed again with the eighths of inches for 2nd and 3rd inches. If you wish sixteenths to appear, subdivide each space on line X Z (Fig. 4) into two equal parts and proceed as before; you will have sixteenths on X Y, and the decimals in like manner. The drawing of these scales would be most readily done with the point of a strong needle, or "etching needle," upon the brass itself. If you cannot engrave, cover your brass with a ground of melted wax, which you can smoke till black in a candle flame, and scrape the lines through it to the surface of the brass as fine as you can; then etch it—that is, bite in the lines with one part nitric acid to three parts water; wash in clear water, dry thoroughly, and melt off all wax by heating. You may then rub the black wax into the etched lines and polish the surface with charcoal and oil first, and rottenstone afterwards.

Printer's rule is planed true and straight at one edge, and is bevelled at the other; it is $\frac{12}{16}$ in. deep or wide (*i.e.*, exactly the diameter of a shilling). As the thick edge is true, utilise it, filing the outer edges away, or cut it lengthwise to $\frac{5}{16}$ in. full, and then finish square with a file to the exact width of $\frac{5}{16}$ of an inch. Likewise fit two other pieces 1 in. long by $\frac{5}{16}$ in. wide on the upper face of the slides S, S. Screw them in place, and let the pins previously mentioned project through them; or another plan is to drill holes for these pins and rivet them at back, afterwards screwing the plates to the wooden slides S, S (see perspective view, Fig. 3) with $\frac{3}{8}$ in. screws, as shown, countersunk, as before. A line square across the brass plates should be engraved or etched, passing exactly through the centre of pins marked *k, k* (in Figs. 1, 2) in order that these points may be brought opposite to any of the divisions of the two scales previously etched or engraved on the pieces A, A, B, B. On the rod, which may be called a "trammel," you may have a pencil holder (as shown, Figs. 6 and 7), with thumbscrew T, and the rod may be divided into scales of inches and centimètres also to save measurement. Note, however, that the scales *a a, c c* commence at *nought* from the line E E, and the trammel commences from C (see Fig. 6). Under the trammel you may fix a slide for the first hole representing the point K, and have a movable slide with a thumbscrew to fix at any point on the scales having a hole drilled for the other point K to enter, to save boring holes that in time would wear away (see Figs. 6 and 7), and by having trammel rods of varying lengths, upon which both the slides *r, r* and the pencil holder *p* would fit, any size of ellipse could be described. Instead of a pencil, the blade of a cutting gauge could be used, which would cut

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cardboard mounts or thin wood mats at once, instead of merely drawing them. This will complete the construction; now for the directions for use. Place one of the slides, that which is in line with the major axis or diameter, with its point *k* exactly covering the point c; now determine the size and proportion. Suppose you wish to describe an ellipse of 10 in. long by 8 in. wide—*i.e.*, major axis, 10 in.: minor axis, 8 in., for instance, or 15 in. by 11½ in., or any other size and proportion.

Rule I.—*Deduct half the minor from half the major, and the result gives the distance the points k, k should be apart.* Example:—Half 10 is 5; half 8 is 4; deduct 4 from 5—difference 1; set the point on the major 1 in. from the point *k* at c. Then take a piece of wood, say ¼ in. square (or stronger according to the nature of the wood), and make two holes 1 in. apart at one end, and set off 5 in. from the hole nearest the end in which the holes are made, and at this point make a notch. Placing a pencil point at this notch, twist, with your fingers half-way between the points *k*, *k* with one hand, and holding a pencil flattened with a penknife at one side against the notch at 5 in.—the rod round as if you were describing a circle—you will find that, instead of a circle, you are describing an ellipse 10 in. by 8 in. Now, instead of this example, take half 15=7½, half 11½=5¾—deduct 5¾ from 7½, result 1¾. Set one point, as before, exactly over c, and on the major set the other point *k*, 1¾ in. from c; then with your rod in the holes 1¾ in. apart, mark off 7½ in. for the position of the pencil and describe the curve—result, an ellipse 15 in. by 11½ in. Curiously enough, if you add to both the same number of inches, etc., with the same distance between the points *k*, *k*—say 2 in. or 3 in. or 5 in., etc.—and add 2 in. or 3 in. or 5 in. to the length marked off on the rod, the ellipse becomes 17 in. by 13½ in., and 18 in. 14½ in., or 20 in. by 16½ in., etc., as the case may be—*i.e.*, the orbits are parallel throughout. If you add 20 ft. or 30 yards, the orbits are still parallel; only add it to both major and minor and to the rod measurement, leaving the distance between the points *k*, *k* the same. Hence

Rule II.—*All ellipses drawn from the points, k, k at any given distance apart are equidistant from one another at every point of their orbits*—i.e., *parallel to one another.*

On some future, and I hope not far distant, occasion, I hope in "Shop" to give a scale of co-ordinates in relation to the points *k*, *k*, which by a new rule will give the exact area of any given ellipse. The holes marked on plan at *g*, *g*, *g* are to fix the plate G G G G down to the board or paper with drawing pins, as shown at *g*, *g* in section in Fig. 2, to prevent shifting. To cut veneers, or grooves in them for inlaying for table tops, etc., use the cutting-gauge blade instead of the pencil, altering the length of rod or trammel only, but keeping the distance from the points *k*, *k* the same to insure parallelism of elliptical orbits.

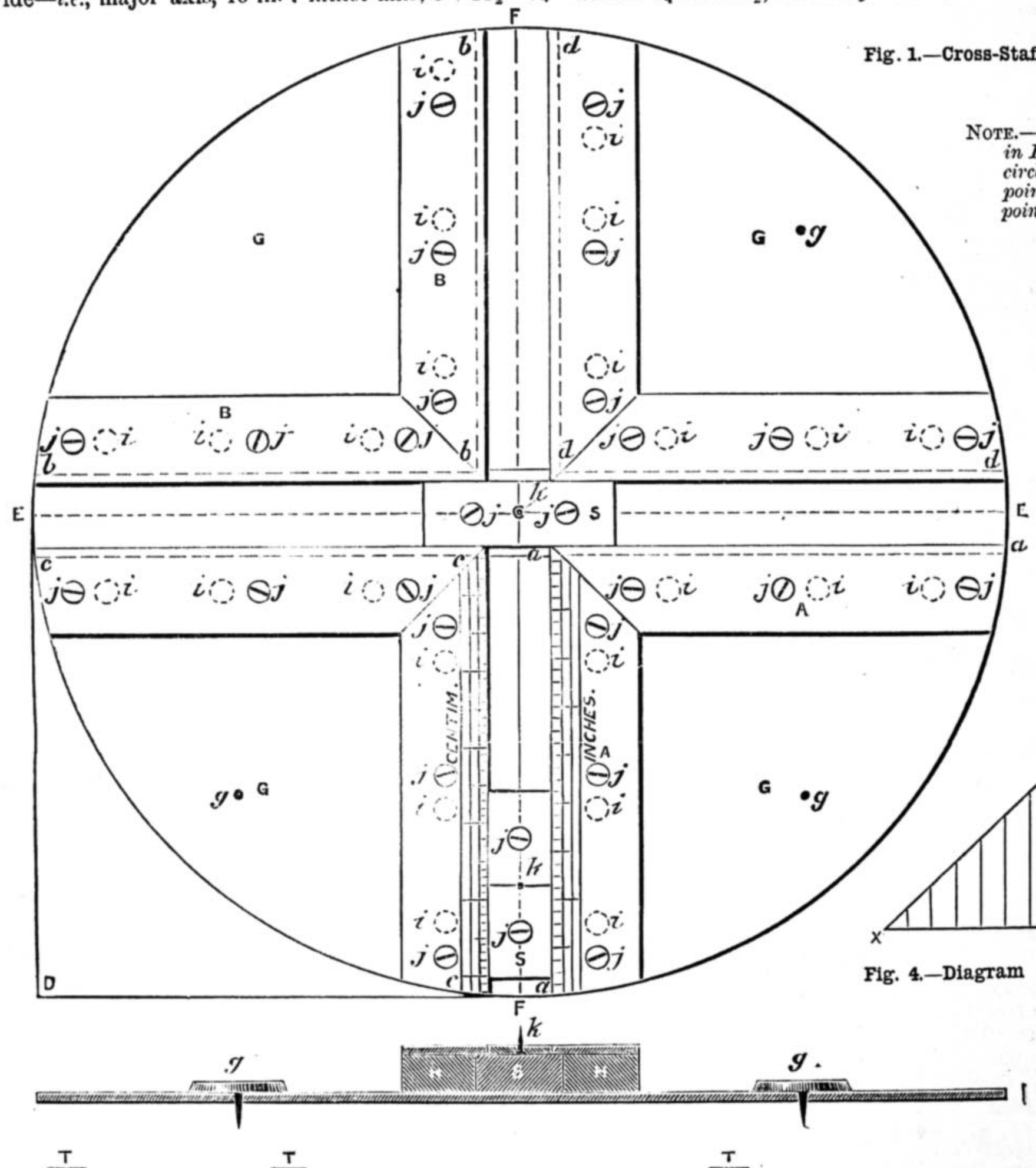


Fig. 1.—Cross-Staff for Drawing Ellipses shown in Plan.

NOTE.—*The intersection of the straight lines* E E, F F *in Fig.* 1 *is the point indicated by* C. *The small circle within the letter* C, *coincident with the point of intersection of* E E, F F, *represents the point k.*

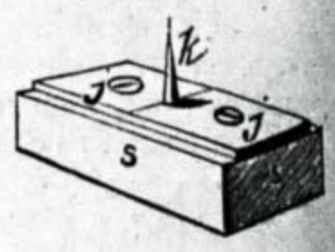


Fig. 3.—Slide.

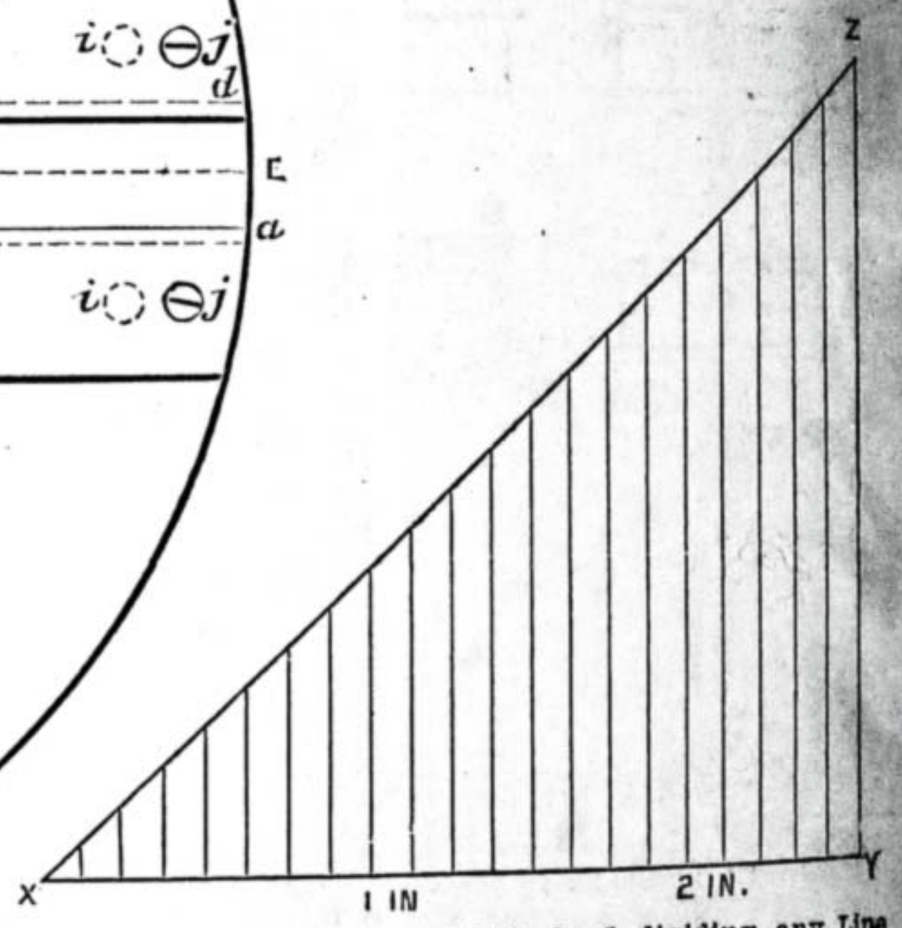


Fig. 4.—Diagram showing Method of dividing any Line with accuracy.

Fig. 2.—Section of Cross-Staff.

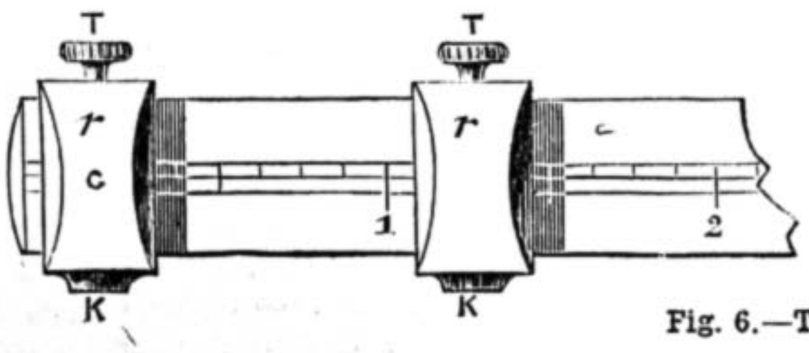
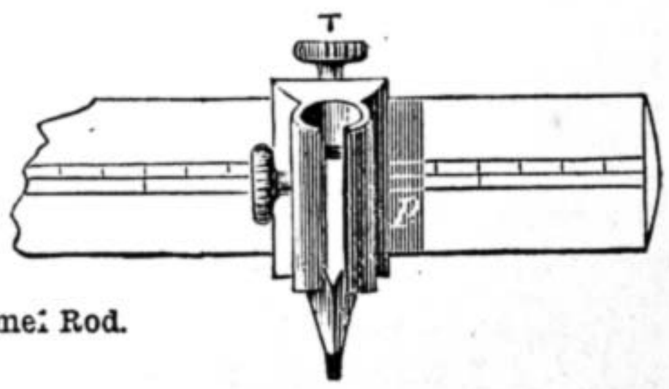


Fig. 6.—Trammel Rod.



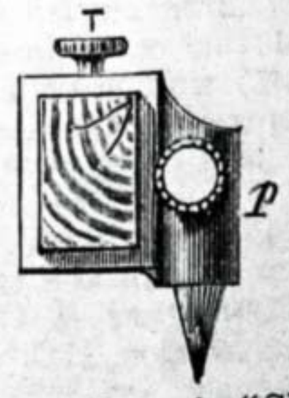


Fig. 7.—Carrier for Pencil and Section of Rod.

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HIVES AND OTHER APIARIAN APPLIANCES.

BY APIS.

The Bingham Smoker.

There can be little doubt that the Bingham is the favourite smoker among English apiarists. I read somewhere that nearly forty thousand of them are now in use and giving the greatest satisfaction in every case. There are, however, Binghams *and* Binghams, so the amateur mechanic should be very careful in having a real article to copy when he goes to the trouble of making one. He may rest assured that if he follows my instructions carefully he will have a smoker of which he may be justly proud, and which will do good service in his battles with infuriated bees.

To bring the details of its manufacture more freshly to my mind, I persuaded myself that my old smoker (of my own make too) would be likely to get out of order in the coming season, and that it was necessary to make a new one. This I accordingly did, and am now describing what I myself made within the twenty-four hours before writing this.

As I am not a professional sheet-metal worker, I probably did some things in a different way to what a tradesman would do, but I think my readers will not lose by this, but rather gain, for they will see how an ordinary amateur with the most primitive tools turned out a capital job.

There can be no doubt that to make a smoker pays. The entire cost of mine, made of the very best tin, was fourpence. The leather, indeed, I got from the saddler, who would not charge, but I think if everything was put down at its highest price, the cost would not amount to a shilling, and I could not buy a similar article for less than 4s. 6d.

A word as to the tools required by us for the tin work, which will be so prominent a feature in the blower and the various extractors, may not be out of place.

First a *snips* will be required for cutting the tin, as to attempt to do so with the family scissors is a most disheartening performance.

Then a *stake*—which is, I think, called a *hatchet stake*—is employed to turn the tin over on, either for wiring the edge or connecting two pieces together with the joint I showed in describing the Clarke firebox. My hatchet stake is simply two feet of so-called half-round iron, which in reality is 1¾ in. wide, and only ⅜ in. thick. This I hold in the vice, and when the edges have been smoothed with the file it does excellently.

Next comes the *soldering iron* or *copper bit*, which, for our work, should be of large size, able to hold a good deal of heat. A few mallets of hard wood and hammers, a punch or two, and odd bits of iron complete my kit.

As to materials for the construction of the smoker, we will require tin, wood, leather, a small bit of ½ in. brass tube, and about 3 ft. of hard brass wire 16 gauge.

I would strongly recommend the best tin to be got. What I used was called *boat tin*, and cost 4d. the sheet, 12 in. by 18 in. It was quite a pleasure to work with it, because of its toughness and ductility. It quite resembled copper.

In Fig. 1, I give a general view of the smoker complete. It will be seen to consist of T, fire tube; F, funnel; G, hand-guard; H, strip to secure tube to bellows; and B, bellows.

The fire tube is 2½ in. in diameter and 6¼ in. long. The piece of tin of which it is made ought to be cut accurately square, and with straightedges 8⅜ in. by 6⅜ in. The two short edges are then to be turned over a little more than ⅛ in. from the edges, one being turned up and the other down.

The piece of tin is then to be bent into a cylinder, and the bent edges hooked into one another and hammered down tight, using a piece of thick round iron or steel as a stake on which to hammer.

When the cylinder has been made fairly circular, it will be found to be 2½ in. in diameter. I usually run a little solder along the joint as a precaution, lest in subsequent operations it might open, and I would advise readers to follow my example, as it is very annoying to find the work come asunder just when everything is nearly finished.

Both ends of this cylinder ought now to be quite flat; but if they are not, the file should be used until they are made so; ⅛ in. at one end must now be turned out all round at right angles to the body of the cylinder, and this can easily be done with the good tin we are using by means of a hammer and the stake, or the sharp edge of a cast-iron lathe bed, which I pressed into service as being more solid. The cylinder will thus be reduced to its final length, 6¼ in. Within ¾ in. of the flanged end, a ½ in. hole is to be bored through the tin. This I did with a common centre-bit, which, contrary to my expectations, was not injured much.

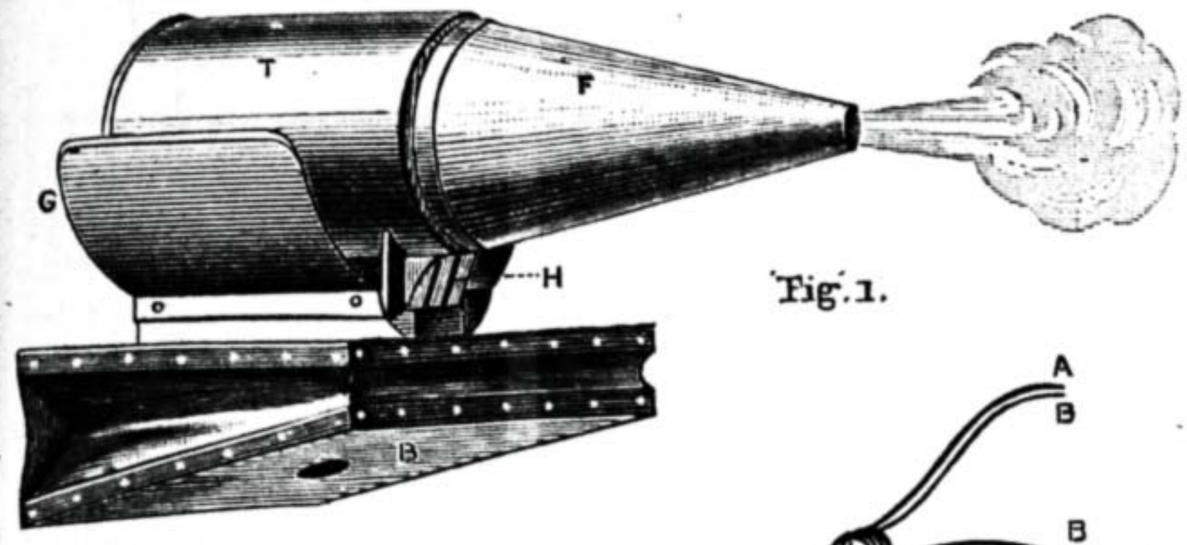

Fig. 1.

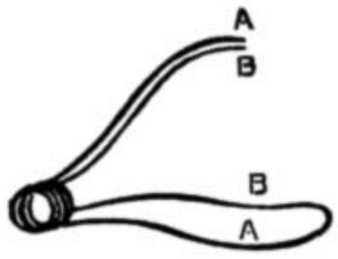

Fig. 7.

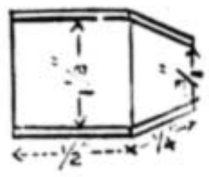

Fig. 5.

Fig. 6.

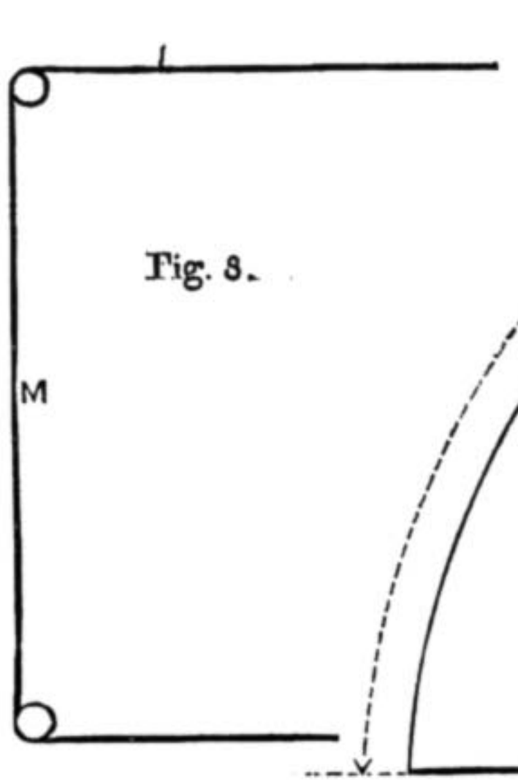

Fig. 8.

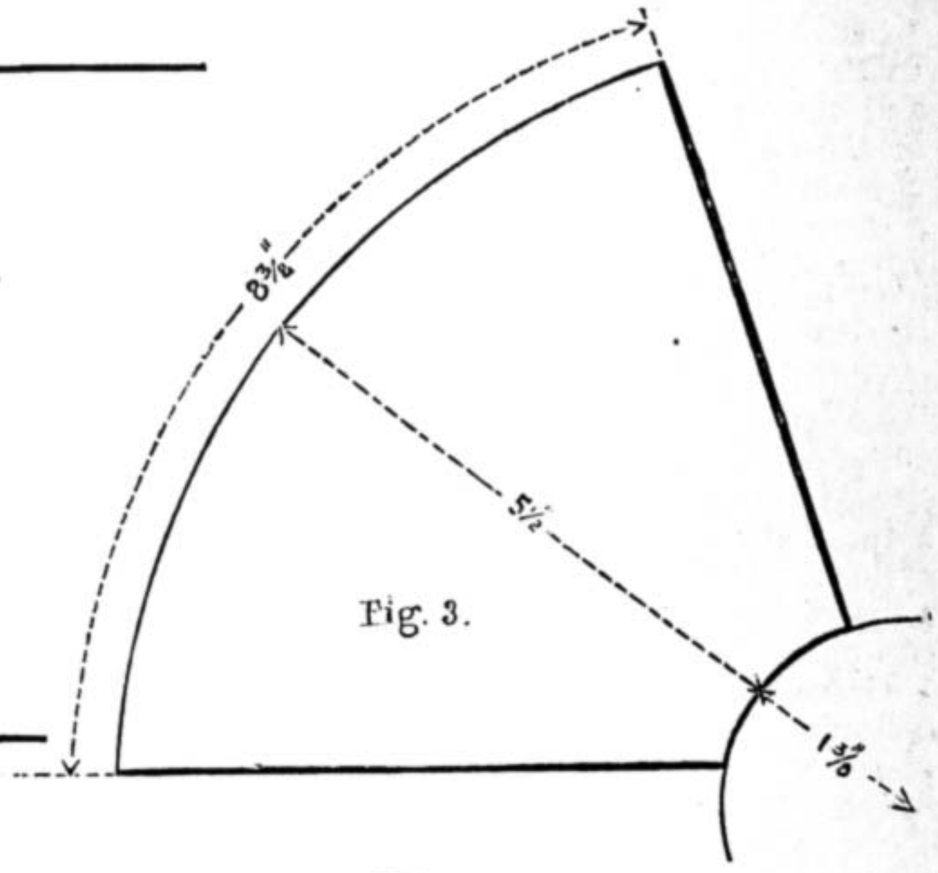

Fig. 3.

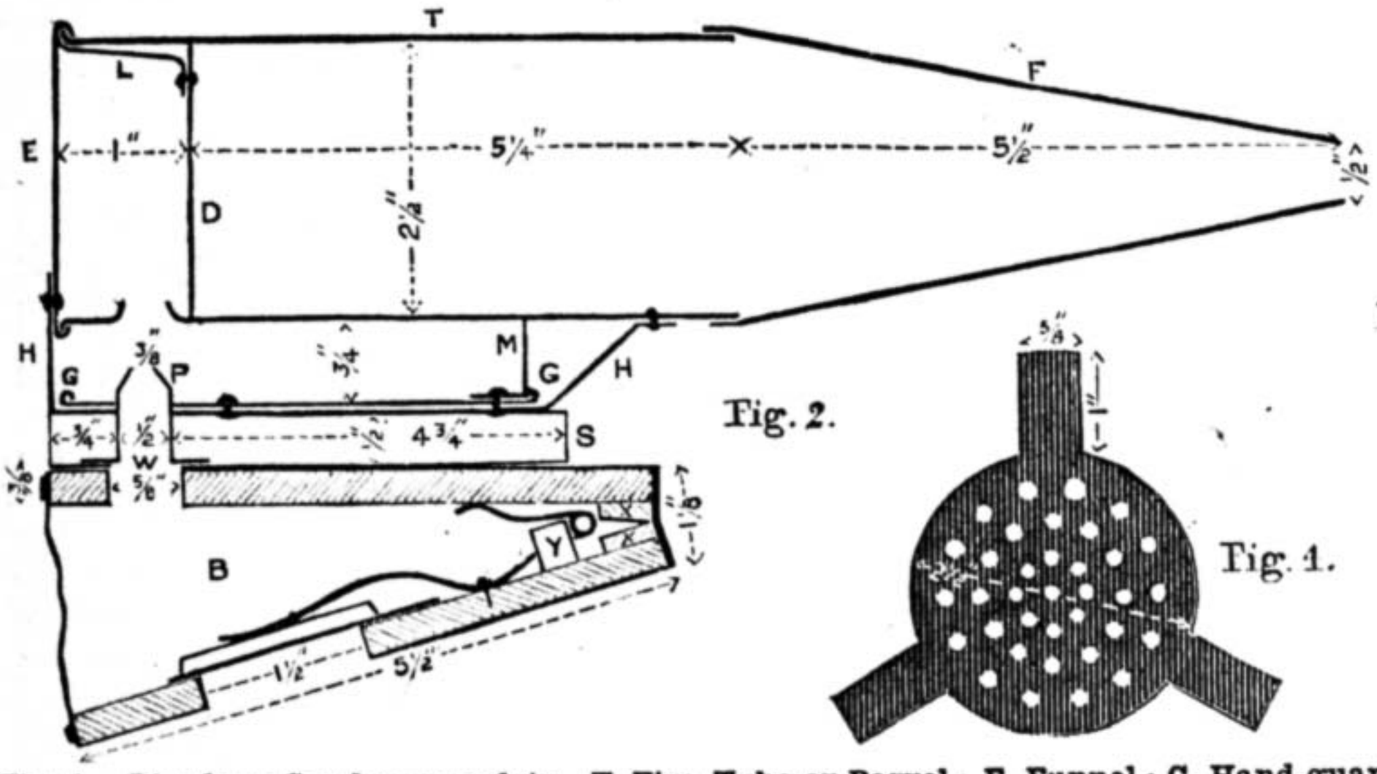

Fig. 2.

Fig. 4.

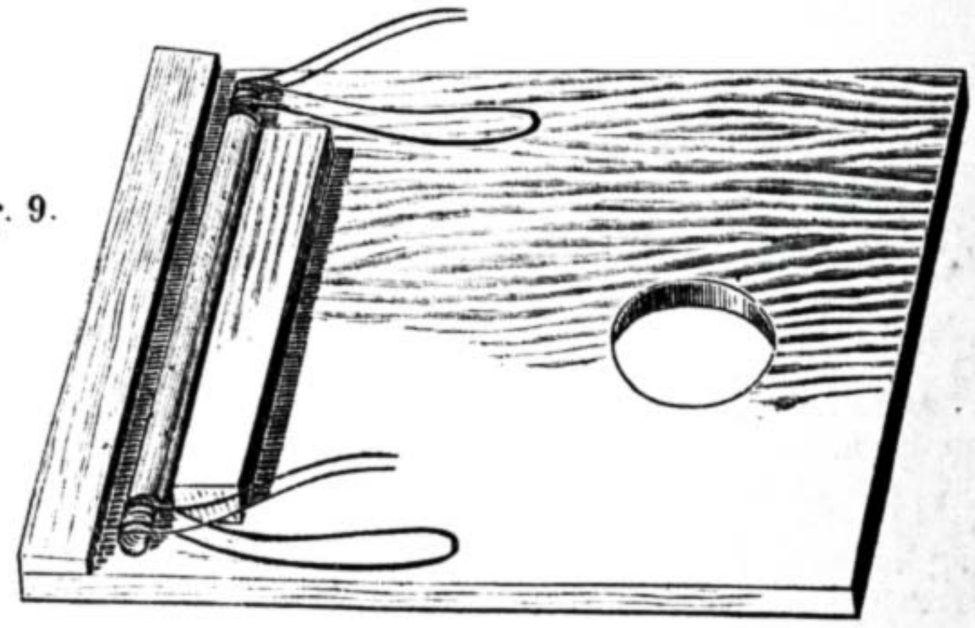

Fig. 9.

Fig. 1.—Bingham Smoker complete—T, Fire Tube or Barrel; F, Funnel; G, Hand-guard; H, Support; B, Bellows. Fig. 2.—Section of Bingham Smoker. Fig. 3.—Pattern of Funnel. Fig. 4.—Diaphragm. Fig. 5.—Coned Blast Pipe on a larger scale than at P in Fig. 2. Fig. 6.—Nicked Tube for making Blast Pipe. Fig. 7.—Spring. Fig. 8.—Wire for making Spring twisted round Nails. Fig. 9.—Bottom Board of Bellows with Springs in place.

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This hole is to be coned inwards as seen in Fig. 2, the object being to direct any of the blast which might impinge upon the sides of the hole inwards into the smoker, rather than between the fire-box and guard. The cone I made with the pane of a light hammer and a little patience.

The end or bottom E (Fig. 2) is next to be cut out of a piece of tin, its radius being just 1½ in., ⅛ in. of the edge being turned up all round, like a cover of a canister; the flanged edge of the cylinder is laid in it, and the edges turned in to embrace the flange and keep all tight as seen at E (Fig. 2). The turning up of the edge of the bottom I did on the end of a piece of thick round iron which was cut true.

The funnel may next be prepared, a pattern for which is given in Fig. 3. The circles should be scribed on the sheet of tin to the radii shown, the inner being 1⅜ in., and the outer 6⅞ in; 8⅜ in. are then to be measured on the circumference of the outer one, and lines drawn to the centre; the piece may then be cut out, turned up and down at the edges, and connected as for the body tube. The edges which are turned over should, however, be a little bit narrower than in the body, which will make the large end of the funnel wide enough to embrace the tube T. The end of the funnel should be hammered, so as to make about ½ in. of its wide end parallel to fit on the cylindrical body. I also made the body taper a bit at the front so as to make the cone run on easily.

Descending from the body towards the bellows, the next thing we meet is the piece M, which is a sort of additional support to the barrel. It is simply a piece of tin 1½ in. square, having two edges turned down and hammered flat, making it ⅞ in. wide. It is then bent at right angles, having one leg ⅝ in. and the other ⅞ in. long. It is attached to the hand-guard and support H by the short leg, while the long one is hollowed out to fit the curve of the body of the blower.

The next thing to make is the hand-guard, which is a piece of tin 6⅞ in. by 4¾ in. wired all round with thin wire. The wiring is easily done by first cutting small pieces off the corners of the tin, then turning up the edges all round, laying the wire in the hollow made by the turning up and hammering down, so as to completely cover the wire, and leave a nicely formed bead wire; 16 gauge would do nicely for the hand-guard. The hand-guard is bent to a semicircle.

We now come to the support, which is made of a strip of tin 7½ in. long and 1⅝ in. wide.

Lines must be scribed on one surface ⅜ in. from each edge, thus marking it into three parts, the centre one being ⅞ in. wide. At 1¾ in. from one end, and at 1¼ in. from the other, nick the sides into the lines, and turn over the edges of the end pieces, thus doubling the tin at the ends and making them only ⅞ in. wide. The centre must also have its edges turned up, but only at right angles, to the middle part, thus making a sort of trough which will fit on the piece of wood (s Fig. 2) that is nailed to the board of the bellows.

The ends of this piece of tin are now to be turned up in the opposite direction to the trough, the short one at right angles, and the longer one at an angle of 135° with the middle part. This last end is to be bent again, a little more than 1 in. from the first bend, so as to lie parallel to the centre part.

We may now proceed to rivet these parts together, for which we will require four little rivets ⅛ in. thick and ¼ in. long.

One rivet connects the support H, the hand-guard G, and the little piece M, all together towards the front, while another 1½ in. from the back holds H and G together. A ⅝ in. hole should now be bored through H and G ⅜ in. from the back, again using a centre-bit, and the whole may be attached to the barrel with the two rivets shown. The top of M should be filed hollow to fit the curve of the barrel, and the front part of H hammered to a similar curve.

The holes for the rivets may be either punched or drilled, but the former will usually be found the easier method.

The diaphragm D (Fig. 2) is mostly made of sheet iron, and the legs are sometimes riveted on, but it is much easier to cut it out of the iron at once, legs and all, as Fig. 4. It should be punched with as many ⅛ in. holes as it can stand. The diameter is just a little less than 2½ in., and the legs are 1 in. long. They will be turned up at right angles to the body. The leg L in Fig. 2 is riveted on.

The only difficulty likely to be experienced in the pipe P (see also Fig. 5) is the coning of the mouth to ⅜ in. I, however, found it easy to do after having cut two nicks out of the piece of ½ in. tubing as at Fig. 6. I annealed the brass by heating it in the fire, and when cool, was able to hammer the point cone-shaped without much trouble. A touch of solder mended the cut afterwards.

Travelling still downwards we next meet the piece of wood S. As this will bear the whole weight of the tin portion it should be of tough wood. I employed oak, the dimensions being 4¾ in. by ⅞ in. by ½ in. Within ¾ in. of one end a ½ in. hole is to be bored to take the blast-pipe; the upper edges are to be bevelled off and hollows cut to take the heads of the rivets in H (Fig. 2).

We next come to the bellows. The boards of this I made of a piece of an Indian tea chest. Teak, I think, is the name of the wood, and it does nicely, being thoroughly seasoned, fairly hard, and of a good colour and grain. Two pieces for the cheeks of the bellows are 5 in. by 5½ in., two other pieces X, X (Fig. 2) are 4⅞ in. by ½ in., ⅛ in. thick at the back and rather more at the front, so that when the backs of the two boards are brought together the front joint will not open. The piece Y is ⅜ in. square and 2½ in. long, and another piece is ⅜ in. square and 3½ in. long. The wood piece for the valve is 2 in. square and ¼ in. or so thick, and this completes the wood.

When all have been nicely planed and rubbed on a sheet of glass-paper, bore a hole for the valve in one bellows board and one at W for the blast pipe in the other. The latter is ⅝ in. in diameter, and ¾ in. from the back end of the board; the former 1⅛ in. in diameter, and its centre 2 in. from the back end of the board. The burrs which may have been formed in the boring of these holes should be carefully rubbed off with sand-paper. The pieces X, X should then be glued and tacked across the front edges of the boards, and the piece Y on the lower one ⅜ in. behind X, its ends being equidistant from the edges of the board.

The springs must next be made, and as they are rather peculiar I give a sketch of one in Fig. 7. It will be seen that each spring consists of two wires, or rather one bent in two, and as there are two springs there will be four wires pushing the boards apart.

To make the springs drive a couple of wire nails ⅜ in. thick into a bit of wood 6 in. apart. Cut the 16 gauge wire 14½ in. long and straighten it, place it against the wire nails, having the ends project equally at both sides, and turn the ends round the nails, one to the right and the other to the left, giving two and a quarter turns to each end, which will leave them at right angles to the middle part as at Fig. 8. Then bend the middle part at M into a round curve so as to bring the coils together and the loose ends lying side by side. Then with a pliers turn down the points to prevent them from sticking in the boards, and give a little bend just near the coil to make it more ship-shape. The ends of the piece of wood which we have prepared, ⅜ in. square and 3½ in. long, are rounded and stuck through the coils of the springs, and a little bit of thin wire ties them together to prevent them from slipping off. This axle, as we might call it, of the springs is then placed between the pieces X and Y (Fig. 2), and the lower board then looks like Fig. 9.

The valve must be added to complete it. This is a piece of leather 3 in. by 2 in., having the 2 in. square piece of wood secured to one end of it by one tack passing through near its centre. It must not be glued to the wood, for if it were and the wood warped, the valve would not close. Three edges of the wood valve will coincide with three of the leather, and an inch of the latter will project beyond the wood. By means of this tongue the valve is secured to the board with two tacks. A light spring must press very gently on the back of the valve to prevent it from opening unless when the air is drawn in. This can best be made of a bit of watch-spring, which can be procured for nothing from any watchmaker, but a bit of thin hard brass wire would do almost as well; a tack passing through a hole in the watch-spring, or a loop turned on the end of the wire, will fasten it to the bellows board. This spring is shown in Fig. 2.

It would be well to put a narrow strip of leather over the valve and fasten its ends down with two tacks, allowing the valve only about ⅛ in. rise. This is to prevent the children of the family making a doll of the smoker, and feeding it through the too convenient valve. The hinge may now be tacked along the front edges of the boards. It is a strip of leather 5 in. by 1⅛ in., and should be glued to the board edges as well as tacked; the tacks are an inch apart.

The springs may next be put in place, and the outer edges of the bellows boards held 2¾ in. apart while the leather is being glued on. The edges of the boards will be rubbed over with strong glue, and the leather laid on and secured with a few short tacks. The edges may afterwards be cut flush with the outside of the bellows boards.

As a general guide in procuring the leather I may say that a strip 18 in. long, tapering from 3¼ in. in the middle to 1⅛ in. at the ends, does for the three sides, an inch being left at each end to overlap the hinge.

The bellows ought now to be able to work nicely, but it is customary to put a narrow strip of red leather all round the edges of the boards, and to secure it with small brass tacks.

Before the bellows are put together it will be much better to fasten to the upper board the piece S with glue and a couple of screws from the inside, the holes for blast in both bellows and support being over one another. A piece of wire-gauze W (Fig. 2) should be put between the two,

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covering the blast hole in such a way as to prevent ash or cinder from the smoker finding its way into the bellows. The contracted piece of brass pipe can now be pushed into place, and the body of the smoker fastened to s with the piece of tin H, which has its edges turned down so as to embrace it; four little screws or tacks will hold it on very firmly.

The smoker is now finished and ready for the fuel, which can be brown paper, sacking, or anything that will smoulder. It should be put in in such a way as to afford passages for the air through it. If it is packed tightly we cannot expect the smoke to travel through the entire length of the barrel.

The form of spring used in the real Bingham entails a good deal of unnecessary labour, and for myself, I cannot see why a spiral spring of the proper strength should not be substituted. Then the front edges of the bellows boards could be brought together, and the four pieces of wood there found could be dispensed with.

I have thus devoted an entire paper to the Bingham Smoker, but it is quite worthy of it, being the only offensive armour we possess. I hope in my next to describe extractors.

MAKING ELECTROTYPE COPIES OF BUSTS.

BY GEORGE EDWINSON BONNEY.

Busts.—When copies of plaster busts have to be made in copper by the electrotype process, special means must be adopted to secure a true mould of the original. This may be done in one of three different ways. (1) Soak the original in linseed oil, let this get dry and hard; coat the surface with blacklead as for electrotyping, and deposit a substantial shell of copper on the outside of the bust. Next saw through the shell at various parts, so as to cut the whole up in sections of suitable size to be used as moulds, and pick all the plaster out piece by piece. Then solder connecting wires to the outsides of the moulds, stop the wires and the outsides of the moulds with varnish, and coat the insides with sweet oil to prevent perfect adhesion of the electro-deposited copper. Place the moulds thus prepared in the depositing solution, and deposit in each a thick coat of copper. When the moulds are taken out of the coppering solution, the original moulds may be stripped off from the inside coats, and these soldered together to form the perfect bust. By this method the original is entirely destroyed. (2) The bust is moulded in plaster of Paris, in two parts, one for the back and the other for the front. The two moulds thus formed are soaked in linseed oil, dried, and blackleaded as for an electrotype, and copper deposited in them in the usual manner. The two halves of the copper bust are then soldered or brazed together. By this method the original is preserved, but the copy is liable to inaccuracies and defective parts. (3) The bust is filled with sand, the lower orifice is closed by pasting a piece of paper over it, and the whole is enclosed in a mass of melted elastic composition. This is slit open when cool, the bust taken out, and the mould thus formed filled with melted wax, which takes the impression of the bust from the inside of the mould. This copy is blackleaded in the usual way, and a thick shell of copper deposited on it to form *the* mould for the true copy of the bust. When this is done, the wax is melted out, the copper mould made watertight, then prepared to receive a non-adherent inside coat of copper, and made to serve for its own depositing vat whilst being lined with a thick coat of electro-deposited copper. Finally, the outside mould is peeled off piece-meal, and the true copy of the bust remains perfect and entire. By this third method the original is preserved, and the copy thus made is formed without resorting to the uncertain results of soldering the pieces together.

As small statues, statuettes, figures of animals, models of fruit, and similar works of art, may be copied in copper by a similar process, and this may be of some interest to the readers of WORK, a few more details of the process may be generally acceptable. For all the processes, a large Daniell battery of at least two 1 gallon cells, or a plating dynamo, will be needed to furnish the necessary current of electricity. For the first two processes, an electrotyping solution of sufficient quantity, and a vat to hold this, will be required. In selecting the vat, choose one which will allow, at least, two inches of liquid above and below and all around the object being copied. For the third process, no vat will be required at the finish, since the mould first obtained on the wax copy will in itself become the vat. For all, a good electrotyping solution will be required, made up as follows:—Dissolve in hot rain water as much sulphate of copper crystals as the water will take up, then to each gallon of copper solution add one quart of rain water, and, finally, add to each gallon of the latter solution from four to five fluid ounces of sulphuric acid. Stir all well together, and filter through a piece of coarse clean calico. More sulphuric acid may be added afterwards if the solution does not dissolve the anode freely. The anode should be of pure electrotype copper, rendered perfectly clean by freshly scouring and rinsing the surface.

When taking a copy of the bust or statue by the first process mentioned, care must be taken to so cut the mould in sections as to leave no signs of disfigurement when the sections are soldered together. A bust may be cut open at the back of the head, and a slice taken out of the shoulders. The parts must not be sprung in getting out the plaster, and care must be taken not to injure or scratch the insides of the moulds. The stopping off varnish may be copal or other good oil varnish, applied only to the outside, and allowed to get hard before placing the mould in the depositing solution. The insides of the moulds are first oiled with sweet oil, and then dried before a fire, before placing in the depositing solution. Care must be taken in stripping off the copper mould not to buckle or otherwise distort the copy. Peel the mould off in little pieces with a pair of flat-nose pliers. Solder all parts neatly together, and hide the soldered joints with gold size and bronze powder.

When taking a copy by the second process, first embed the front half of the subject in sand contained in a box, circumscribe the area of the mould with a rim of cardboard, and smooth the sand level all around the subject. Then take a tuft of cotton, dip it in sweet oil, and lightly oil all the exposed parts of the figure. Next make a mixture of finest plaster of Paris in water, by sprinkling the plaster from the hand into the water, and stirring all the time until the mixture is of the consistence of thin cream. Pour this all over the figure, and thus coat it with a thin coat of plaster, whilst all air bubbles are broken with a feather or a camel-hair pencil. Then pour on enough of the plaster mixture to make a sufficiently thick mould, and leave it to harden. When the plaster is set, turn the mould with its model carefully over, embed the mould in the sand to the level of its edge, brush off any sand adhering to the edges of the mould, and anoint them with oil or with soft soap to prevent the wet plaster of the two halves of the mould from adhering together. Now treat the exposed half of the original in the same manner as the first half, and, when the plaster has set, remove the two halves of the mould from the figure. These must first be dried, then gently baked hard, and whilst still warm smeared with melted wax or with boiled linseed oil, and again made hot to make the wax or oil penetrate into the pores of the plaster, and so render it impervious to the depositing solution. The interior surfaces of the two halves must now be coated with blacklead, to form a conducting film for the copper deposit; several conducting and supporting wires must be connected to various points on the outside edges of each half, and the two halves suspended in the depositing solution until they have been coated with copper to the thickness of $\frac{1}{16}$ in., or even more than this.

The most remote parts of the mould, such as the nose and chin of a bust, will sometimes fail to receive a deposit of sufficient thickness. To remedy this defect, attach a few fine wires to the leading conducting wires, and bring the points of the fine wires in close, but light, contact with the remote parts of the mould. As deposition always commences at those points to which the conducting wires are connected, and preferably those points nearest the anode (at which points also the deposit will be thickest), it will be advisable to bend the anode plates, or so arrange them when placing them in the solution as to bring them close to the most remote parts of the mould, and follow at equable distances its outline.

When the electrotype is complete, it must be removed from the mould, and well washed to free it from copper salts, and then the two halves may be soldered together to form the complete bust. But this part of the operation must be carried out with much care.

In copying busts and undercut models by the third process, an elastic composition is used, which may be made of 12 parts glue and 3 parts treacle, or 8 parts glue and 2 parts treacle, it being a mixture similar to that employed in making printers' rollers. The glue must first be well soaked in cold water until soft, and then melted in a sufficiently large vessel containing a little water. Stir well until all the glue is melted, then well incorporate the treacle. This mixture is very elastic when cold, and will take a fine impression of any engraved or moulded surface. To use it, proceed as directed. First prepare the bust or other model by coating it with oil. If made of plaster, give it a coat of boiled linseed oil, and then set it aside for a few days to harden, and thus render the plaster impervious to the moisture and treacle in the copying composition. Weight the bust by filling it with sand, paste a piece of stout paper over the orifice at the base to keep the elastic mixture from entering there, and suspend it by a piece of wire or string

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in an ordinary galvanised pail of sufficient size to allow quite half an inch of clear space all round, above and below. Mark the pail with a piece of chalk to indicate the position of the back (for here it must be slit open after the composition has cooled), and pour in enough of the melted composition to cover it entire. When this is cool, invert the pail on a piece of clean paper, and turn all out on a table.

At this stage of the proceeding the operator will stand in need of an assistant. Slit the cold composition right down the back with a sharp knife. Gently prise open the slit part, and let the assistant hold the mould whilst the model is taken carefully from the inside. The slit will then close up again, and leave a hollow mould inside, of the exact size and copy of the original model. Protect this from distortion and injury by enveloping it in bandages or in folds of tape, and put it back in the pail. Next melt sufficient beeswax to fill the mould, cut a hole in the base, and when the wax is just cool enough to run freely without setting at once, pour it in the elastic mould. This will take an exact cast of the inside, and produce an exact model of the bust in wax. If the wax is too hot, it will melt the composition and spoil the mould; if too cold, it will not run into the remote parts: it should be just at its melting temperature when poured.

When the wax is thoroughly cold and hard, which will take several hours in a cool place, the mould may be opened, and the wax model taken out. This must now be coated with blacklead, conducting wires fixed to it, and prepared to be electrotyped. Copper must now be deposited upon it until it has all been coated with a moderately thick shell, capable of being handled without fear of injury. This done, remove it from the bath, rinse in warm water, and set it aside to drain. Next set it before a fire or in a place hot enough to cause the wax to run out of it into a convenient vessel, and so free the inside from all traces of wax. To quite complete this, pour a small quantity of sweet oil in the copper mould, turn it from side to side until the oil has been made to cover every part, then drain it all out, and finally set it before a fire until all the oil has been driven out, which is shown when the rim of the orifice ceases to soil a piece of blotting-paper. The mould must now be examined by the aid of a strong light to detect any pin-holes in the shell, and these must be stopped with sealing-wax or by soldering, to render the mould watertight.

The mould thus prepared will form the vat in which the finished copy is to be deposited. Solder two or three conducting wires to the outside of the shell, and fill it with the depositing solution. In this suspend the anode of pure copper, taking care that it does not touch the sides of the mould, nor its conducting wires the rim of the mould. This can be managed by hanging the copper to a piece of wood placed across the orifice of the bust. The anode is connected to the positive pole, and the mould connected to the negative pole of the source of electricity, until a thick deposit of copper has been formed within the mould.

The wires may now be disconnected, the solution poured out, and the outer shell of copper removed piecemeal with a pair of pliers, leaving the inner shell complete, and a perfect copy of the original bust or other figure. In stripping off the shell, commence at the lower rim, and pull a piece off with the pliers; the rest will then come away bit by bit, with proper care, until all the shell has been peeled off. The finished bust or statue may then be bronzed, plated, gilded, or otherwise ornamented, as taste may dictate.

By the second process electrotypes may be taken of fish, or of fruit, or of vegetables. By this last process a copy can be taken of any carved or undercut work of art, as well as of busts or statues.

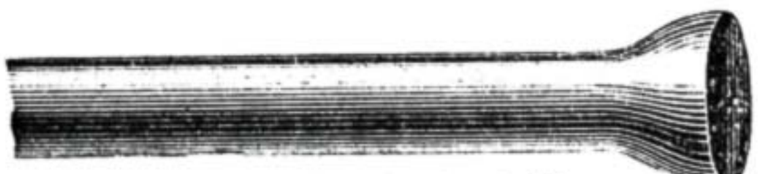

Fig. 32.—Upsetting Bar horizontally.

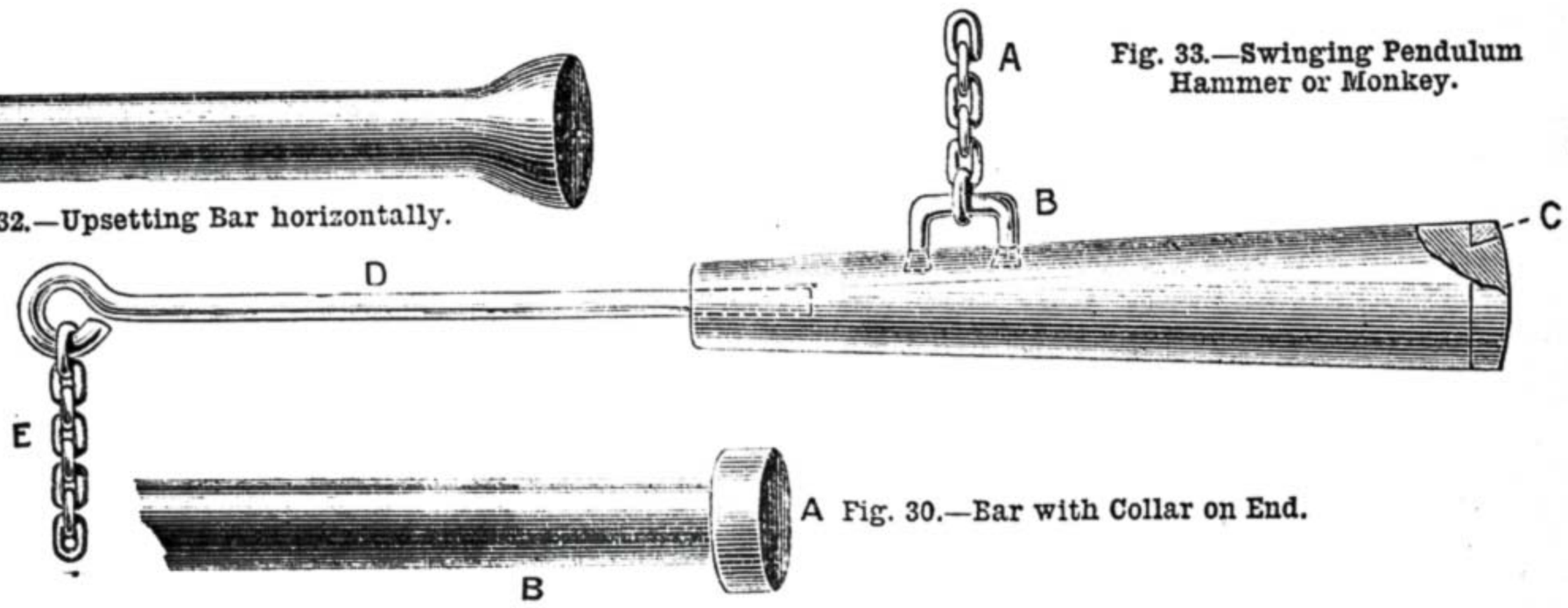

Fig. 33.—Swinging Pendulum Hammer or Monkey.

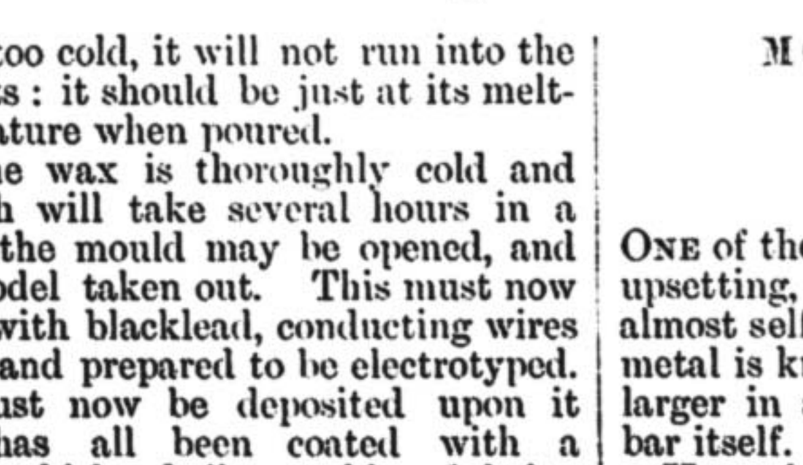

Fig. 30.—Bar with Collar on End.

MODERN FORGING.

BY J. H.

UPSETTING.

ONE of the alternatives of drawing down is upsetting, or jumping up. The terms are almost self-explanatory, signifying that the metal is knocked or dumped up into a mass larger in area than the dimensions of the bar itself.

Upsetting is a slower, more laborious, process than drawing down. A sharp smith will draw down several inches of bar at one heat. But to upset a very moderate mass of metal will require several heats. Hence it is not possible to treat any very large-shouldered portion in this way, but recourse must be had to welding on a ring or collar, or a solid mass of metal, according to circumstances; these being, in such cases, the only practical alternatives of drawing down. The steam hammer does not afford so much aid here as it does in drawing down, because, unless the iron is cut off sufficiently short to go endwise under the hammer, the use of the latter is not possible. There is, however, an appliance found in most shops of average size which, in a lesser degree, fulfils the purpose of the hammer: namely, the monkey, or swinging pendulum hammer, shown in Fig. 33, which I shall notice directly.

The method of upsetting is generally as follows:—Suppose it is required to form a collar A (Fig. 30) upon the end of a bar whose original section is that of B, and without welding the collar on as a ring. We take the bar, enclose the end which is to form A in the fire, but heat no more of that end than the precise amount we want to upset, and keep that portion of the bar which is in immediate contiguity with it quite cool and black by heaping damp coal around it. The end is then raised nearly or quite to a welding heat, and taken from the fire. Sometimes on removal from the fire, and just before upsetting, the extreme face of the heated end is dipped into the slack trough in order to chill it, and so the better prepare it to resist the blows of the hammer; but this is not always done.

The upsetting is performed in one of three or four ways. Thus the bar may be held up in both hands (Fig. 31) in a vertical position, and the white hot end jumped down repeatedly upon the anvil face, or else upon the plate of cast iron, which is often let into the ground alongside of the anvil stand for this purpose. Another way is to lay the bar in a horizontal position upon the anvil face (Fig. 32), holding it in one hand if light, and hammering the end to be upset with a hand hammer. Or if it is heavy, it will be held in both hands, or, perhaps, slung in a chain from the forge crane, and upset with a sledge hammer or hammers. Or, again, when very heavy, it is laid upon the anvil face or upon a levelling block, and the swinging monkey (Fig. 33) is driven against it. The monkey is suspended with a chain A from any convenient beam overhead. Being heavy and drawn back several feet from the perpendicular, and then let go, it strikes the iron with a large measure of accumulated force.

Fig. 31.—Jumping Bar vertically.

The construction of the monkey is as follows:—

It is made of cast iron, and is balanced carefully on its centre of gravity by the correct setting in position of the eye B,

(*Continued in page* 338.)

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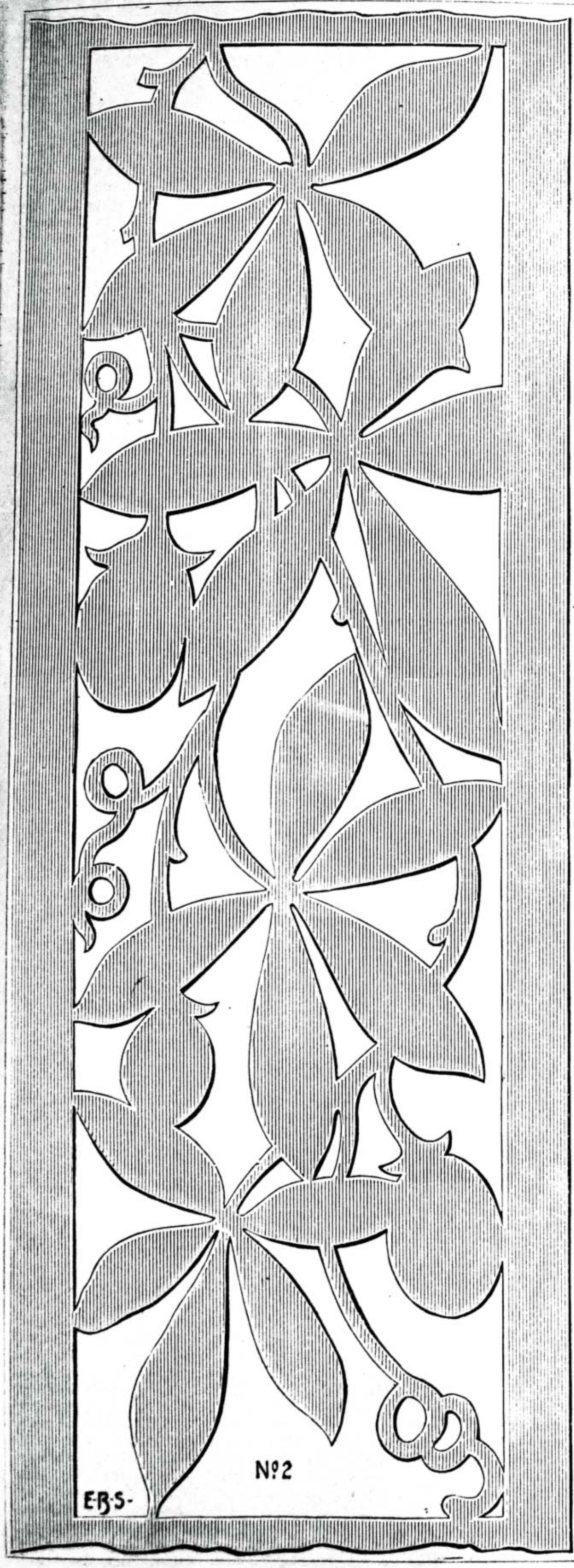

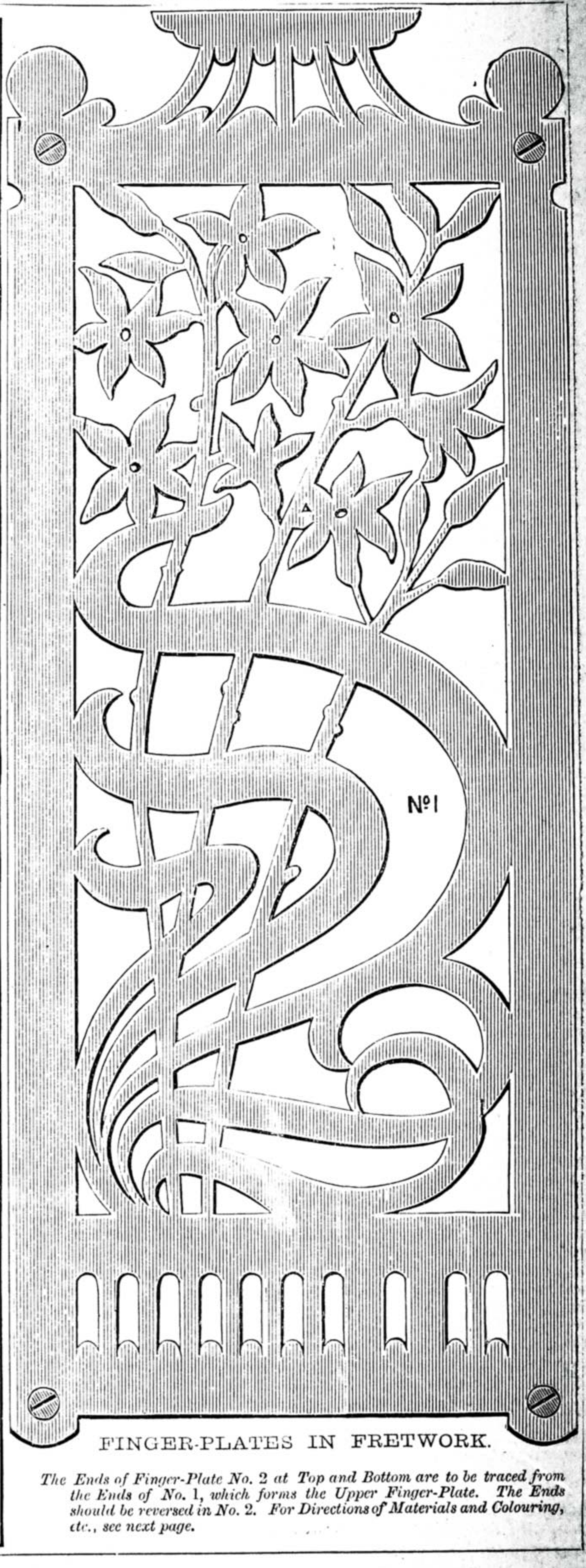

FINGER-PLATES IN FRETWORK.

The Ends of Finger-Plate No. 2 at Top and Bottom are to be traced from the Ends of No. 1, which forms the Upper Finger-Plate. The Ends should be reversed in No. 2. For Directions of Materials and Colouring, etc., see next page.

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which is cast into the bar. The battering end is preserved from fracture, and from too rapid wear, by means of the wrought-iron band C which fits around, and is shrunk into a shouldered recess of dove-tailed section. The handle, or porter, D is of wrought iron cast into the monkey. It is provided with an eye, through which a small chain or rope E is passed, by means of which the monkey is pulled backwards after every blow.

Several heats, often amounting to three or four, are required to jump up a moderate mass of metal. The reason is that fairly exact dimensions are not at once obtainable by this method, as in the case of drawing down. The jumped up mass of metal, in spite of much care in localising the heat in that precise position where it is required, is, nevertheless, very unequal, and quite destitute of sharp shoulders. Hence considerably more metal has to be massed together than is actually required in the finished work, in order to allow of symmetrical finish to size.

Upsetting tends to separate the fibres of the metal. It is, therefore, necessary to counteract this tendency by hammering the jumped up portion at a welding heat.

When the metal for the collar is massed in sufficient quantity, then it is finished to a parallel diameter in swages, and the square shoulder finished with a set hammer or flatter, or in swages, and the end with hammer and flatter.

A collar can be also formed upon any portion of a bar situated away from the ends, by localising the heat in the position required, and then jumping up the metal at that particular section until sufficient mass is obtained for finishing to size and shape. And of course any sections, other than those of round bar, can be heated by upsetting, and the spreading out can be performed in one direction more than in others, if required.

TWO FINGER-PLATES FOR FRET-CUTTING.

BY E. BONNEY STEYNE.

IT is somewhat curious that amateur fret-craftsmen do not more frequently select finger-plates whereon to display their skill in the use of the saw, for these very useful additions to a door are easy to make and to apply. They can be made pleasantly decorative in effect, and whether left in the natural wood, polished, enamelled, or gilded wholly, may prove not merely ornamental in themselves, but assist in decorating the door they are presumed to protect from the finger-marks so sadly disfiguring its fair surfaces. But to plead for the use of finger-plates is as absurd as to advise the employment of umbrellas in wet weather; the advantages in either case are so obvious, that it is too late in the day to attempt to justify them.

The amateur, who is such an undesirable "weak brother" to the sturdy professional who reads these pages, is at least a well-disposed, harmless creature, who delights in trying his 'prentice hand upon simple joinery, and for the very weakness of his tribe, who regard the requisite fitting together of a fretwork bracket as a feat in joinery that taxes all the resources of their tool-chest, and calls out all their ingenuity, these things should be specially welcomed. For, to affix them with four small screws, or even four brass or pearl-headed tacks, is within the powers of the veriest bungler that ever misused a tool.

Owing to the space rigidly imposed by the size of our pages, it is impossible (while keeping to the useful full-size for a fretwork pattern) to give the larger plate in its actual length. Yet to trace the missing top and bottom pieces from the shorter one, that can be represented in its complete form, is so easy that an apology for the maimed one is hardly needed.

If the door is plainly painted, the plates entirely gilded, or painted with a suitably contrasting enamel-colour, would probably look better than if left with the natural grain. Tastes, however, differ as widely as individuals. Your acme of good taste may be my terrible example of bad, or *vice versâ*, so to avoid dialectic homily, it is best to let the advice of subsequent finish remain unwritten; for advice is so rarely followed that it is a superfluous article to bestow, and in the rare instances when a rash person has followed it, the consequences are not always pleasant to advised or adviser. Yet to insist on the improvement gained by following the lines of the design accurately, instead of at a wavering and uncertain distance, to see that the parallel lines are truly kept, and the external edges shot with a plane true and smoothly, is worth enforcing, also the necessity of choosing very thin wood, lest the whole look clumsy; but the rest may be left to the brains of those who care to work out the designs accompanying this description.

OUR GUIDE TO GOOD THINGS.

*** *Patentees, manufacturers, and dealers generally are requested to send prospectuses, bills, etc., of their specialities in tools, machinery, and workshop appliances to the Editor of* WORK *for notice in "Our Guide to Good Things." It is desirable that specimens should be sent for examination and testing in all cases when this can be done without inconvenience. Specimens thus received will be returned at the earliest opportunity. It must be understood that everything which is noticed, is noticed on its merits only, and that, as it is in the power of any one who has a useful article for sale to obtain mention of it in this department of* WORK *without charge, the notices given partake in no way of the nature of advertisements.*

55.—BRACE WITH SPLIT CHUCK FOR BITS.

THIS is a brace, apparently of German manufacture, on the lines of Spofford's Patent Brace, an American tool made on the same principle. The chuck, or part which takes and grips the bit, is split longitudinally and vertically for full 4½ in., so that it expands on the insertion of the squared end of the bit in the grooves cut for its reception. It is made in two sizes, supplied at 2s. and 4s. 6d. Buyers, however, should have one of Spofford's make, although it costs more. The form of the brace is good, though not new; and is preferable to the ordinary bit-brace. Spofford's Patent Bit Brace may be obtained of or through any dealer in tools. It is made in three sizes—8 in., 10 in., and 12 in.; sold respectively at 6s., 6s. 6d., and 7s. 6d.

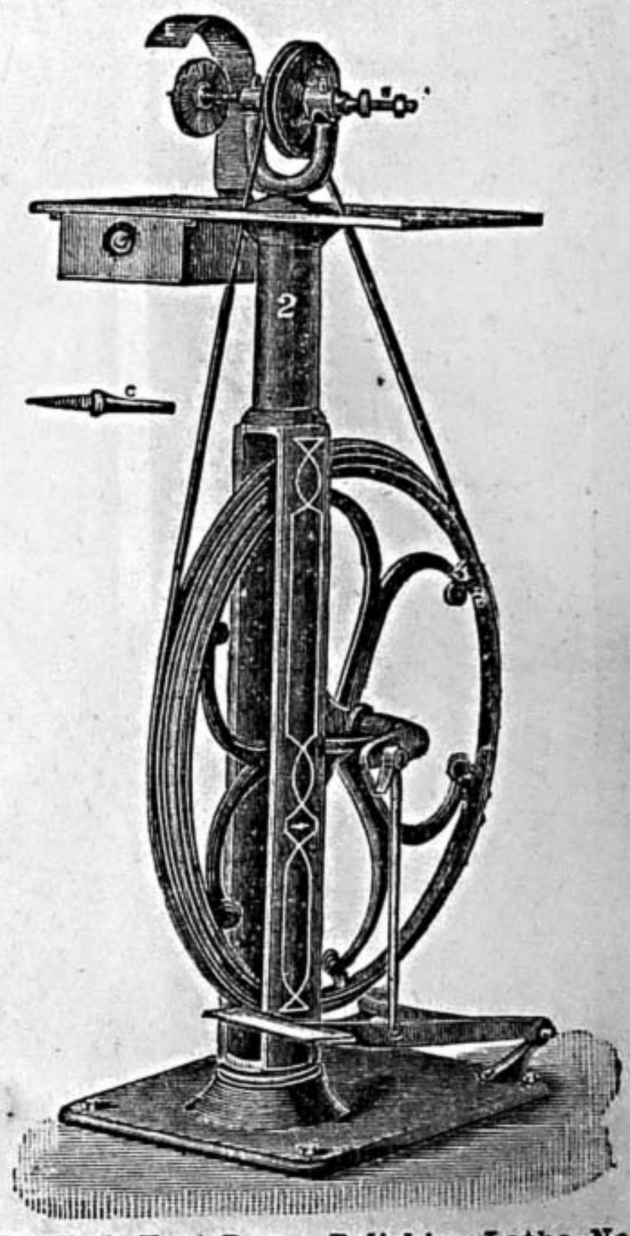
56.—SOME RELIABLE METAL SALTS AND THEIR USES.

I have received from Messrs. W. Canning and Co., Great Hampton Street, Birmingham, some samples of metal salts prepared by them for electro-depositors. Of these, the most notable are the specially pure double sulphate of nickel and ammonia, the cyanide of copper and of zinc, and the carbonate of copper and zinc. The first need only to be dissolved in water to form a nickel-plating solution. The copper and zinc salts are used in making up solutions for copper-plating, zinc-plating, and electro-brassing. The same firm have also favoured me with a specimen of their cast nickel anodes, and specimens of the brushes, bobs, and mops sold by them for polishing metals. These are all well made, out of good materials, and sold at reasonable prices. This firm supplies all requisites for electro-platers, and the famous American polishing compositions now coming into favour with metal-workers.

Messrs. J. and E. Hartley, 13, St. Paul's Square, Birmingham, also send samples of salts, and specimens of scratch-brushes, mops, and bobs made by them. They are all of excellent quality, but those deserving special mention are a circular mop made of basil leather and a calico mop spirally stitched. When two such firms as Messrs. Canning and Messrs. Hartley run each other so close in producing goods of equal quality, we should do a wrong to our readers in attempting to say which is best, both alike being so good. The low prices and the excellence of the materials should tempt amateur and professional platers alike to give up all idea of making their own. It says much for the enterprising spirit of Birmingham when it can turn out two such competitors in good work.

57.—PATENT FOOT-POWER POLISHING LATHE.

Country tradesmen who undertake to do repairing and relacquering jobs in brasswork are sometimes put to some expense for carriage, and have to suffer anxious delay in getting the job finished,



Hartley's Foot-Power Polishing Lathe, No. 2.

by having to send it to a long distance for the purpose of getting it polished and lacquered. By procuring one of the Patent No. 2 Foot-Power Polishing Lathes, made and sold by Messrs. J. E. Hartley & Co., Birmingham, and shown in the annexed figure, together with a full set of polishing and finishing materials, all such jobs may be done in the country workshop, and finished with the transparent cold lacquer sold by the same firm. This lathe stands 3 ft. 9 in. in height from floor to centre of spindle. The balance wheel is 26 in. in diameter, has three turned grooves giving three changes of speed, and will run easily up to 3,000 revolutions per minute. Its total weight is about 128 lbs., and the price 70s. Ironmongers, jewellers, silversmiths, plumbers, and electro-platers who have no steam power will find this lathe invaluable. It is shown with a circular metal scratch-brush fixed to the spindle, but this can be replaced with an emery wheel or a polishing mop if desired. The spindle B is intended to hold a circular bob or buff for polishing, but this can be unscrewed and replaced with the taper spindle C if required. It would be found useful in clubs, hotels, restaurants, and other similar establishments where a quantity of plate and other metal work has to be kept clean and well polished.

THE EDITOR.

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SHOP:

A Corner for Those who Want to Talk It.

NOTICE TO CORRESPONDENTS.

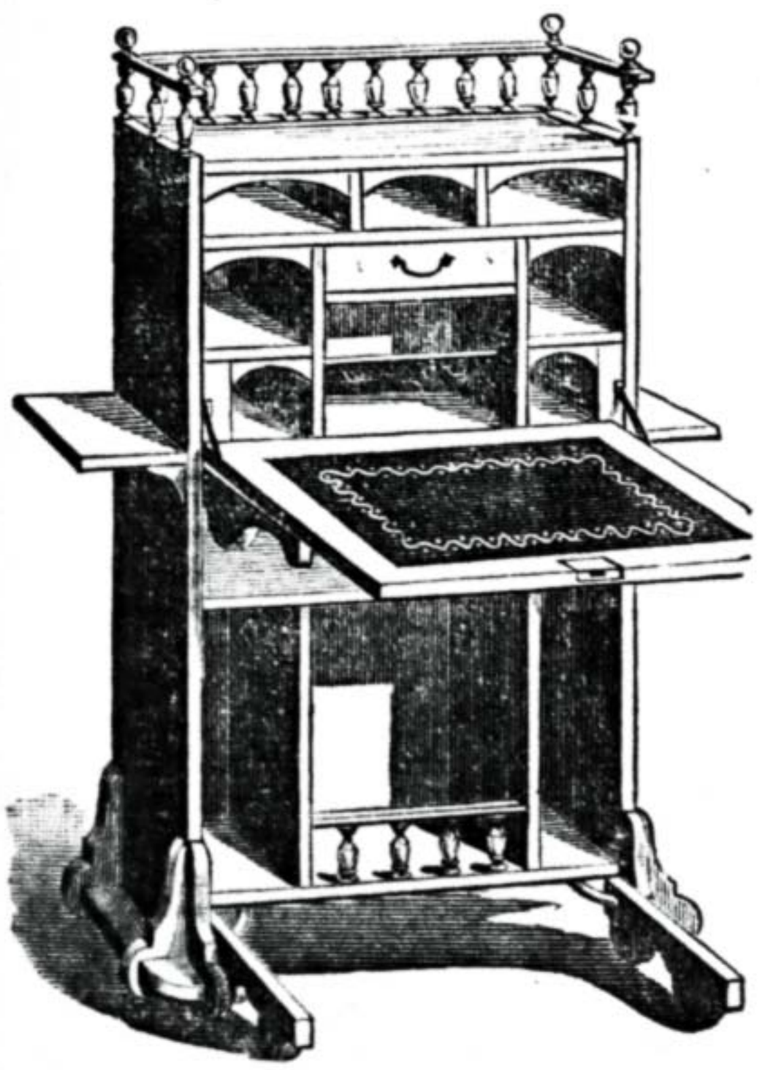
*** *In consequence of the great pressure upon the "Shop" columns of* WORK, *contributors are requested to be brief and concise in all future questions and replies.*

In answering any of the "Questions submitted to Correspondents," or in referring to anything that has appeared in "Shop," writers are requested to refer to the number and page of number of WORK *in which the subject under consideration appeared, and to give the heading of the paragraph to which reference is made, and the initials and place of residence, or the nom-de-plume, of the writer by whom the question has been asked or to whom a reply has been already given. Answers cannot be given to questions which do not bear on subjects that fairly come within the scope of the Magazine.*

I.—Letters from Correspondents.

Escritoire.—D. B. (*Perth*) writes: "I enclose a sketch of an escritoire which I have just finished. The idea is something after Mr. Gleeson-White's, with a little of Mr. Adamson about the feet. However, I think that in Mr. Adamson's screen secretary, the supplementary feet have to be pulled out

Escritoire Shut.



Escritoire Open.

with the hand, where, in the one I have made, I have introduced a small lever at each side of writing flap, which works a simple combination of springs and levers, for throwing out the feet and supports when the flap is opened and pulling them in when shut. I made it all myself with the exception of the spindles, which I got turned for me from patterns which appeared in WORK, although you may not be able to recognise them from sketch. I have stained it mahogany, and I may say that I have been waiting patiently for the articles on French polishing to appear; if they do not early, I may venture to try my hand, after reading all the answers on the subject in 'Shop.' I am a loom tenter by trade, but sometimes I think I should have been a joiner or cabinet maker, as I enjoy very much working among wood."

Watchmakers' Book.—A. G. L. (*London, N.*) writes:—"In the answer to J. R., *re* 'Publications,' in No. 66 of WORK, 'Britten's Watchmakers' Handbook' is published by the author at the Horological Institute, London, and sold retail by such firms as Grimshaw & Baxter, Goswell Road; Gray, Clerkenwell Green; and Ehnhuus, Soho. Nelthropp's 'Watchwork, Past and Present,' is published by E. & F. Spon."

II.—Questions Answered by Editor and Staff.

Spring Hinge.—DISAPPOINTED.—I am sorry your previous letters have received no reply, but there is tremendous strain upon "Shop," and even now you do not enclose your name. You will find it very troublesome to make spring hinges, but you can be supplied with them by Mr. Robert Adams, 67, Newington Causeway, London, S.E. His latest production, the "Crown Victor," is durable and satisfactory in its action.—F. C.

Book on Organ Construction for Use of Organ Builders.—EXCELSIOR (*Liverpool*).—The only work I know of is that by Hopkins and Rimbault. The French work founded on Dom Bedos is not of modern date.—M. W.

Mica.—G. P. (*Edinburgh*).—Messrs. A. Tannahill & Co., 21, Mincing Lane, London, E.C., supply mica for electrical and other purposes, and not only keep stocks of all ordinary sizes, but also cut mica to any shape, size, and thickness that may be required.—ED.

Tools for Engraving on Copperplate.—A. G. (*Burton-on-Trent*).—The form of tools for engraving on copperplate is practically the same as for crest work, with slight modifications. The lozenge graver is most commonly used, whetted to the various angles required by the work in hand, the "setting off" of these gravers being almost *nil*, owing to the flatness of the work. You do not say what kind of work you wish to do; I therefore give a list which, I hope, will meet your requirements, and if any difficulty is experienced in obtaining the tools, my address will be found in Nos. 52 and 53 of WORK.

1 dozen (or less) lozenge gravers.
1 " " handles for same.
1 steel curved-end burnisher } Handled.
1 " triangular scraper }
1 " etching or tracing point }
Set of three or four sand-bags, or engravers' cushions.
Pitch block for mounting plates on while being engraved.
Copper plates, *ad lib.*
Spring dividers, true straight-edge, and square and rule combined. Arkansas oilstone, oilcan, turpentine, pencil, tracing paper, impression paper, and copperplate printing ink, for impressions to test the progress of the work.

There are other tools used by the copperplate engraver, but the foregoing list will give you a good start. In conclusion, you must be prepared for a few difficulties in connection with the cutting of copper, as, unless the engraver is used to it, he has a difficulty in producing a smooth cut.—N. M.

Engraving Name Plates.—ENGRAVER.—The usual term "graver" is applied to all the cutting instruments used by the engraver, except the "chisel," which term speaks for itself. The general term of "graver" is superseded when the graver is whetted to the form or angle required by the workman—viz., an angle graver, a round-nosed tool, a flat-edged tool, a shading tool, etc. I would suggest that ENGRAVER should take the number of WORK containing the illustrations of the tools required by the engraver, and ask the dealer if he has any such in stock. If you are unable to get what you want in Glasgow, you might write to Messrs. Buck, Holborn Viaduct, London, E.C., or Messrs. Fownley, Bull Street, Birmingham, who, being retailers, would be glad to execute any order, however small. I do not know of any dealers nearer Glasgow. A Boston correspondent writes me that he has made some chisels from the illustrations in WORK, and has used the same with success. I have only to add that these chisels may be made out of disused spindles, which, as a rule, are very good steel, and at times may be bought for 1s. per dozen. I shall be pleased to hear again from ENGRAVER, and of his progress in the art of engraving.—N. M.

Paraffin Lamp Chimneys, etc.—S. W. (*Bristol*).—(1) Unfortunately, lamp chimneys are made principally abroad, either in Belgium or Germany, and English workmen, instead of supporting their English fellow-workmen, are tempted by the cheapness of the imported article to buy inferior stuff, rather than purchase at a slightly higher price a better home-manufactured chimney, better annealed and of better "metal." For anything special, you will have to pay proportionately more, and as I do not know whether there are any glass-blowing firms in Bristol, I advise you, if your directory can give you no better information, to send a tracing and dimensions of the exact shape and size you require to the Whitefriars Glass Works, Temple Lane, London, E.C., for estimate. (2) I cannot at the moment give you any information as to coloured paper window blinds, except those being manufactured in Japan; you might get them from any dealer in such imported goods.—J. W. H.

Boot Varnish.—SLACK.—I do not know of any make that I can really recommend, as the so-called varnishes destroy the leather. Even the Government do not adopt them for the army, either for boots or harness, though I believe Harris's blacking and harness blacking, or Day & Martin's, are as good as any. I can give no recipe.

"To shine the boot, for Beauty's foot,
Why keep your brains a-wracking?
Advised by me, try Harris's B———,
You'll find there's nothing LACKING!"
—J. W. H.

Warped Wood.—STEREO.—From what you say I am afraid the wood has gone too far for any remedy to be effectual. You might, however, try the effect of leaving it on a cold flooring such as that of a cellar. The hollow side of course must be downwards. After it has flattened, which may take a few days, put it under pressure for a time. If it does not keep flat then you may consider the stuff useless. The remedy you have tried ought to have been as good as any if properly applied, and I am afraid you have failed through being in a hurry. The one I advise you to try is more gradual, but in untrained hands the result is likely to be more lasting. As the job you are making is small, could you not plane down pieces which are awkward?—D. A.

Bench Stop, etc.—W. E. J. (*Chippenham*).—(1) A good bench stop for ordinary work can easily be made by making a square hole through your bench and fitting into it a piece of hard wood. This of course is the stop. It must fit so tightly that it will not fall through by its own weight, but not so firmly that a tap or two with the hammer will not move it up or down. (2) The brass must be cleaned thoroughly and then relacquered. Read what has already been written in back numbers on brass work. (3) Certainly, wax polish applied with rags is a creditable polish for fretwork, if the finish suits the style of work. Of course if you want a glossy surface you must use French polish, but for many things wax is at least equally good, and is much easier. A paper dealing fully with wax polishing has appeared in our pages already. No; your questions are not too many, and if in different trades you should put each on a separate piece of paper, but do you not think that before writing it would be well to look through WORK? It would save you waiting for information.—D. D.

Violin Bow.—J. G. (*Abingdon*).—To cleanse the hair of your violin bow, take the screw out and wash the hair with a piece of flannel, soap, and warm water, and rinse with cold water; now put the screws in again, shake the water off, and put the bow in a warm place until the hair is dry. Speaking generally, it is better to have a bow rehaired when it is dirty and full of resin, as usually when that state is reached the beard, or natural roughness, is worn off; when this is the case, resin cannot make the hair bite properly.—B.

Staining Canvas.—NIGER.—You will find it better and more economical to buy the canvas ready prepared, and you can easily do so in your city. If you do not know any one who supplies it, try J. H. Peck & Co., 4, Goree Piazzas. If, however, you wish to try the staining yourself, use creosote.—D. D.

Oil from Cloth.—A. M. (*Hull*).—Rub the greasy parts with a clean rag moistened with benzine. In doing so be careful not to injure the cloth with rough usage. The benzine itself will do no harm, as it evaporates very quickly. Better to do the work in the daytime, as the stuff is very inflammable. If fuller's earth is more convenient try it, though for such a job as yours I cannot give it unqualified recommendation.—D. D.

Drawing, Reducing, and Enlarging.—F. S. (*Almondbury*).—The instrument you inquire about is known as a pantograph. It is to be bought from any artists' colourman or dealer in drawing materials.—D. D.

Compositions for Handles.—J. D. M. (*London, N.W.*).—You and other correspondents must quote the page and number of WORK in your inquiries. You can search your numbers as conveniently as can a busy Editor. When you see anything likely to be of value to you in the future you should act on Dr. Cuttle's advice and make a note of it.

Battery for Telephone.—C. W. J. (*Clapham Common*).—The telephone described in the November part of WORK does not require a battery, as it is a magnetic telephone.—G. E. B.

Electric Light for Laundry.—D. M. L. (*Battersea*).—The workpeople would find the electric light a great boon. Its superiority to gas would be soon appreciated in the ironing room. But the cost would be three times that of gas, and the first outlay greatly in excess of that needed for an installation of gas lights.—G. E. B.

Wire for Medical Coil.—W. H. S. (*Salford*).—A medical coil should have a larger core than ¼ in. The core should be at least ½ in. in diameter. Wind two layers of No. 18 double cotton covered copper wire on the core for primary, and till up the bobbin with No. 28 silk covered wire for secondary. Sharp, stinging shocks are not needed, and may be hurtful.—G. E. B.

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Tinsmiths' Book.—TINSMITH.—The book you inquire about, "Metal Plate Work, its Patterns and their Geometry," by C. T. Millis, is published by Messrs. E. & F. N. Spon, 125, Strand, and the price of it is 2s. crown 8vo cloth. Thinking that many besides yourself would like to know a little more about it, I give below a synopsis of its contents. Introductory problems: classification of patterns. Class I. Patterns for articles of equal taper of inclination of slant, and made up of (*a*) round surfaces (pails, coffee-pots, etc.), (*b*) plane or flat surfaces (hexagonal coffee pots, baking pans, hoods, etc.), (*c*) curved and plane surface combined (oval teapots, oblong pans with round corners, equal end pans). Class II. Patterns for articles of unequal taper, and made up of (*a*) round surfaces (tapering pieces of pipe, etc.), (*b*) plane or flat surfaces (hoppers, hoods, etc.), (*c*) curved and plane surfaces combined (oval and oblong canister tops, tea bottle tops, oval baths, hip baths, etc.). Class III. Patterns for miscellaneous articles (elbows, articles of compound bent surface, as vases, aquarium stands, and mouldings). Useful memoranda on solders and properties of metals. The patterns in Classes I. and II. are set out in one, two, and four pieces, on a short radius method.—R. A.

Gas Engine Slide Ignition. — ONE IN A FIX.—I would strongly advise ONE IN A FIX to keep to the hot tube ignition, as being most simple, and it does not take any power from the engine to drive it as a slide valve does; in fact, your engine would not have power enough to drive a slide valve if you did arrange one on it, as it would be larger than the cylinder, and would look very unsightly. As regards the consumption of gas, I consider the hot arrangement the most economical, though the slide valve may not use so much gas to ignite the charge in the cylinder as the tube takes to keep it hot; the former takes a considerable amount of power to work it, which means more gas consumed in the cylinder. Perhaps you have not got your tube arranged just right; the hot tube should not be in contact with any more metal than can possibly be helped: for instance, it should not be screwed into the cylinder or cover, but an iron washer about $\frac{3}{16}$ in. thick and $1\frac{1}{4}$ in. diameter, or smaller if possible, should be fastened on cover, or wherever tube is arranged, by two or three small screws, having the join made with a piece of asbestos so as to break metal contact as much as possible; the tube should be screwed into this washer and be encircled by a piece of asbestos millboard, leaving a space of $\frac{1}{4}$ in. all round tube. I make a small high-speed gas engine myself which ignites by hot tube as stated; above bore of cylinder, $2\frac{1}{8}$ in.; stroke, 4 in.; speed, 350 revolutions per minute. This engine will give $\frac{3}{4}$-man power on the brake; weight, 60 lbs.—J. S.

Frame Mouldings, etc.—L. J. P. (*Wellingborough*).—We have heard many times of the firm City Frame Company, 29, Basinghall Street, E.C. Price of solid oak moulding a number of patterns, $\frac{3}{4}$ in. wide, 1d. foot run; 1 in. wide, $1\frac{1}{2}$d.; $1\frac{1}{2}$ in., 2d.; 2 in., 3d. I find these as cheap as those of any house; our readers, seeing this, may be able to give us cheaper houses.—G. R.

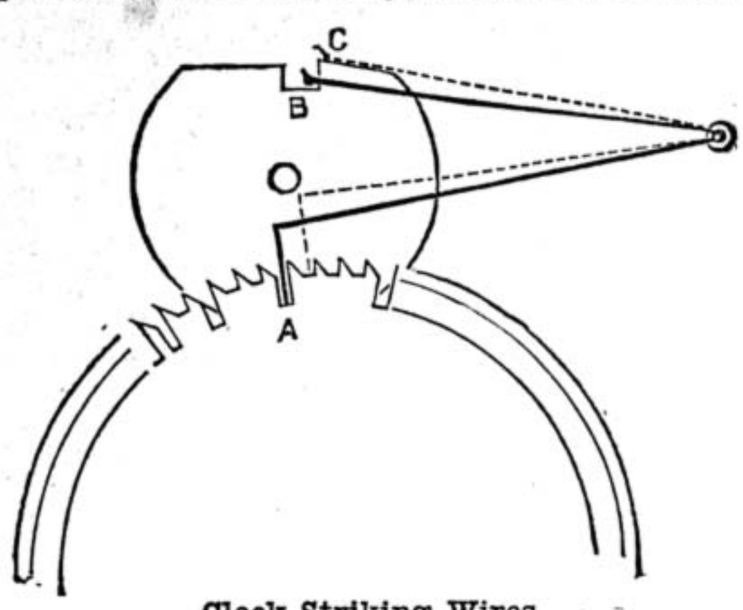
Picture Mounts.—G. B. (*Accrington*).—If your mount is a thick one, usually known as 12 sheet, you need only damp your picture, and glue to mount, and let it dry under a press. The usual manner adopted by the trade is to lay the photograph or drawing upon a wood pulp, which is good and cheap, with glue or starch; when dry, thin round, leaving about an inch of card beyond the picture or opening in the mount, and glue close up to where opening will come; lay mount on, rub down, and let it dry under press.—G. R.

Octagon.—C. S. (*Aldershot*).—To describe an octagon, draw lines at right angles to each other through the centre of a circle and bisect the angles made by the lines thus drawn.—F. C.

Grindstone and Screw.—NO NAME.—Do not attempt to mend a broken grindstone; it will not stand. The internal thread can be cut by a chasing tool in a lathe. See "The Practice of Hand Turning," published by Messrs. Spon.—F. C.

Boiler Cleaning.—F. C. B. (*Battle*).—The boiler you mention is not zinc, but is made of cast iron, coated with zinc by the following or a similar process. Clean the pan thoroughly by scouring and by pickling in dilute sulphuric acid; pass it through a strong bath of aqueous zinc chloride solution, slightly acidified with hydrochloric acid, and then through a bath of molten zinc covered with sal-ammonia. This process is known as galvanising, and the boiler you describe is known in the trade as a galvanised furnace pan. The reason yours marks the clothes is because the zinc coating has worn off and the rust from the cast iron boils into them. It would be cheaper to buy a new one than to attempt to regalvanise it. They are sold according to their capacity—*i.e.*, at so much per gallon, and you ought to be able to get one at 6d. per gallon. Those made of copper are much more money, but there is no fear of their ever marking the clothes, and when they leak they can be repaired, which is an advantage over the cast-iron ones. Copper boilers are sold by weight at about 1s. 2d. per lb., and average slightly over $1\frac{1}{4}$ lb. to the gallon. If you loosen your old pan by pressing up the rim with a screwdriver or chisel, you can easily lift it out; and if you get a new one the same size, you can slip it into its place without the aid of a bricklayer. You can, if you like, cement round the edges with a little Portland cement, but it is hardly necessary. Articles on sewing machines will, no doubt, appear as soon as space can be found for them; meantime I should advise you to get "Sewing Machinery," published by Crosby Lockwood & Co., price 2s., which gives full particulars as to construction and adjustment of sewing machines.—T. W.

Striking Wires.—NO NAME.—The top wire has the end bent at a right angle in a horizontal direction, the bottom one a right angle in a perpendicular direction, and this part drops in the locking or count plate, which is sometimes carried on the great wheel. Sometimes the great wheel itself is used, and sometimes it is a separate wheel keyed to the plate; in any case put this wheel in its place, also the wire and the wheel that has the disc on it, part of which is cut away either in the form of a



Clock Striking Wires.

snail or sometimes simply a notch. Let the bottom part of the wire drop in a long notch or deep cut A of the count wheel, and then bend the other or top part of the wire till it drops about half way down the notch B in the disc that is fixed to the wheel, when you will find it right; but to make sure lift the wire out of the count plate, move forward or backward till it rests on a shallow cut, then see that you can turn the wheel with the disc on it round, and that the hooked wire just frees the top of the notch, as dotted lines C.—A. B. C.

Binding.—C. L. F. (*Brighton*).—Make up your notebooks in sections instead of single sheets, and sew them in the ordinary way instead of wiring them. There is no other method, and it is strange that you did not think of this. Books treated in the above manner will lie perfectly flat when opened.—G. C.

Inlaying.—ROUGH CARPENTER.—Borders and centre pieces for inlaying can be obtained from Messrs. D. Witt & Palmer, Drummond Street, Euston Square, London.—D. D.

Practical Bookbinding.—J. R. (*Huntly, N.B.*).—It is rather difficult to advise you what course to adopt to gain the requisite knowledge to enable you to set up the business of a practical bookbinder. You would certainly require to serve some time at the trade if you wished to be able to do bookbinding as it ought to be done. It is customary to serve an apprenticeship of seven years, and there are a great many duffers in our trade, even after having spent all that time in learning the intricacies thereof. I have not heard of premium apprentices in our trade, but no doubt some binder could be found who, for a consideration, would give you the run of the shop. Personally I would advise you to try to get some one who is a bookbinder to join with you, and in that case you could look after your own branch, and he could undertake the binding. This is the most satisfactory arrangement I can think of; for there is a great deal more in bookbinding than appears upon the surface. Looking at a book when bound, it seems but a trifling matter to bind it—to sew it together and put a bit of leather or cloth upon it. Let me assure you, however, that it is no trifling matter; there are so many details consequent upon the proper binding of a book that only years of practical experience can supply the requisite knowledge of the method of filling in these details. I am sorry that there is no book which I can recommend upon this subject. There are books which have been written and are no doubt considered paragons of excellence in this respect, but as I cannot recommend them for practical purposes it is useless to give the publishers' names. See the articles upon this subject in WORK, the first of which appeared in No. 57, Vol. II. With regard to the necessary tools, etc., please see WORK, Vol. II., page 44. If there is anything else which I can do for you, either now or at any future date, please write and let me know.—G. C.

Sign-Writing Book. — PAINTER (*Sheffield*).—"The Art and Craft of Sign Writing," price 21s., is sold by the Decorative Art Journals Company, 15, St. Ann Street, Manchester.—H. L. B.

Initials on Ivory.—M. A. G.—You had better trace your letters on some tracing paper, and afterwards rub the back of paper with some soft lead-pencil; now lay the paper on the ivory, and go over the outlines again with a sharp-pointed pencil, and an impression will be left on the ivory. Carefully outline with some black colour, and afterwards fill in the various colours to taste. Use fine tube oil colours. You will find useful directions for tracing designs in the various works on china painting; and as to painting on ivory, I should think a deal of information could be gleaned from the shilling handbooks published by Rowney, and Windsor & Newton, on the subject of miniature painting.—H. L. B.

Waterproofing Canvas.—VERITAS.—I can recommend VERITAS to use the following composition as most suitable to his purpose, and more likely to give entire satisfaction. I have found it most successful over a period of more than thirty years. Take one part of yellow beeswax, one part of resin, and two parts of Russian tallow. Melt them in an earthenware pipkin, and stir them well to incorporate the materials. When well melted and hot, pour in one part of spirits of turpentine, and stir it well in, taking great care not to let it catch light or run into the fire. The parts may be ounces, pounds, or any weight most convenient, but they must be well mixed and thoroughly incorporated. To use it for canvas, let it be melted and made thoroughly hot; then with a brush, paint or spread it evenly over one side of the canvas, keeping the canvas exposed to the heat of the fire; and when all has been gone over, take a large flat iron—taking care that it is not too hot—and having placed the canvas on a flat, even surface, iron it all over on the surface which has been covered, and it will cause the composition to be spread evenly on the canvas and to enter well into the substance of the same. One great advantage of this compound is that it has no unpleasant odour, does not crack or peel off, and is flexible, allowing the canvas to be rolled and unrolled without injury; nor does it, like indiarubber or its preparations, decompose and become sticky; nor, like oiled canvas, crack and become rotten.—C. E.

Rubber Tyres.—ECONOMY.—If new rims that have not had rubber before, clean the hollow all round thoroughly, melt the cement in an iron ladle till it runs like syrup or thick cream, and pour a little all round the rim; then put the rubber in place, taking care to have the same side of the rubber uppermost all round; also, if the rubber is somewhat tighter than the rim, pull it a little all round while putting it in place, as it is bad to do all the pulling at one place. The cement will now have cooled somewhat; re-melt by holding the rim over a gas or lamp flame. When the rubber rolls sideways in the rim, and the cement begins to ooze out at the edges, then it is right; go round the whole rim in this way; clean off the superfluous cement after it has hardened. If old rims, melt the cement already in them with a hot poker; put some new cement in if necessary; then put the rubber in place and re-heat as above. Half-inch tyres for wheels 24 in. and 18 in. may be had of Brown Bros., 7, Great Eastern Street; W. A. Lloyd, Weaman Street, Birmingham, or any of the perambulator makers.—A. S. P.

Signboard, "The White Hart."—E. A. S. (*Burton-on-Trent*).—I shall be glad to assist you in every way in my power as regards design for above. I have looked through my prints and cannot find this identical subject, but I think I can photograph a sign outside a public house for you, and this I will endeavour to do and send you a print immediately. In the meantime the following will be useful to many besides yourself. The origin of the sign, the white hart with a collar of gold round its neck, dates from the most remote antiquity. Aristotle, in his history (Lib. IX. Cap. VI.), reports that Diomedes consecrated a white hart to Diana, which a thousand years later was killed by Agathocles, King of Sicily. Charlemagne is also reported to have caught a white stag in the woods of Holstein, and to have attached the usual golden collar round its neck; and another is supposed to have been caught in Windsor Forest. Amongst the oldest inns which have borne this sign is the "White Hart" in the High Street, Borough, London, where, on July 1st, 1450, the rebel, Jack Cade, established his headquarters. This inn was burnt down in 1676, but was rebuilt and is still, I believe, in existence. In 1708 it boasted of having the largest sign in London except one, the "Castle Tavern" in Fleet Street. Charles Dickens has immortalised the "White Hart Inn" by a most lifelike description in his "Pickwick Papers." The "White Hart" was the favourite badge of Richard II., and all his courtiers and soldiers wore badges on their uniforms, trappings, and accoutrements, which was a white hart with crowns of gold about its neck and chains of gold hanging thereon. No illustrations of signboards have appeared in the *Journal of Decorative Art*, which is published monthly at 15, St. Ann's Street, Manchester, price 7d.—H. L. B.

Book on Copperplate Engraving.—J. R. C. (*Bacup*).—I have never seen a work of this description, but I strongly advise J. R. C., and, indeed, every reader of WORK, to collect every scrap of good examples of design, each in his particular line, and paste them into guard books systematically arranged for study and reference. Collections of wood engravings and copperplate engravings, such as ornament, writing, views, etc., if thus saved as they come across one's path and pasted into books, become most valuable for reference in a thousand ways. Examples of every style occur, and tracing these to their origin and period is equivalent to educating oneself in their history. I have such scrap books, commenced thirty-five years ago, which are now simply invaluable to me. Old associations therewith connected are vividly brought to mind, to say nothing of their utility as references.—J. W. H.

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Address.—J. J. D.—The Mr. Wood whose address you ask for has retired from business, which he formerly carried on in the Strand (nearly opposite the *Graphic* office) about six or seven years, selling off all his plant, dies, etc. Mr. Mullord, who was his foreman for years, is the most likely person to give you any information. I have not seen him now for about eight or nine years, and believe he resides still somewhere in or near London.—J. W. H.

Artificial Ivory Name-plates for Organ Stop-knobs.—AMATEUR ORGAN BUILDER.—As you say you cannot obtain ivory or bone, and yet wish to make the name-plates for organ stop-knobs yourself, I give you the following recipe for an artificial ivory, which I have found useful for imitation ivory brush backs and other purposes. Obtain a small quantity of isinglass, and mix it with finely-powdered egg-shells and brandy, so as to form a stiff paste. Make it warm, and then pour it into a mould of the desired size. When cold and hard it will much resemble ivory. The paste can be tinted to any shade desired by the aid of a minute quantity of aniline dye or other suitable colouring matter. The mould must be oiled previous to pouring the paste in. Finely-powdered whiting can be used in place of egg-shells. For name-plates on stop-knobs, it would be well to make a circular sinking in the face of the stop-knob and fill it in with the isinglass paste, and finish off level with the face of the knob. The artificial ivory would then be protected from chipping, as might otherwise occur if it projected beyond the face of the knob. The name of the stop could be printed on the ivory with a small camel-hair brush. When used for large surfaces, the ivory paste is laid on with a brush, allowing each coat to dry before laying on another. It is then levelled with a steel scraper and polished in the same way as ordinary ivory.—M. W.

Fog Signal Patent.—FOG SIGNAL.—The arrangement shown in the sketch sent us is ingenious, but in its present form is not adapted to the requirements of railway work. It is frequently needed to explode two signals in rapid succession, and the plan shown does not provide for this. Many people have given a great deal of attention to this matter, but we have not heard with what results, nor can we say how far the plan proposed is novel, as this would require a search of the patent specifications already filed. As this invention would only be used by railway companies, it would be most desirable to have the support of those who could influence its adoption by them; otherwise it would be found a very uphill job to get introduced.—C. E.

Green Ink, Model Yacht, etc.—YOUNG SHIPWRIGHT (*Jarrow*).—(1) It will be cheaper to buy fluid green writing ink than to make it. Judson's "Simple" dyes, whether green or any other colours, being prepared from aniline, will answer the purpose perfectly well. (2) A pad for inking india-rubber stamps can be made by nailing down to a piece of wood ½ in. thick, of the required size, a piece of fine woaded cloth, or printer's blanket, over a stuffing of horsehair, topped with cotton wool, tacking it to the edge of the wood, care being taken to fold the four corners neatly under by means of pleats. (3) If you write to the Model Dockyard, Fleet Street, London, E.C., and enclose 5s., you will obtain a copy of a very capital book on "Model Yachts: How to Make and How to Sail Them," profusely illustrated, or their illustrated catalogue, post free 1s., might suffice you. By-the-bye, when writing again, pray observe our Editor's rule, to ask each question on a separate piece of paper, as they might have to be referred in some cases to three different experts for reply.—J. W. H.

Photographing on Wood.—W. W. (*Dundee*).—Any dealer in your town in photographic chemicals would supply you; if not, write for catalogue to George Houghton & Sons, Holborn, London, W.C., and state what you require.—J. W. H.

Reducing Crystal Alum to Powder.—PHOTOGRAPHER (*Bolton*).—Pound it in a mortar with a pestle, and sieve through fine muslin, repeating the process with the residue left in the muslin, until all is reduced. Marble pestles and mortars are best. Alum is the double sulphate of alumina and potash.—J. W. H.

Small Printing Press.—W. W. B. (*Rotherham*).—I recommend visiting sales of printing materials to W. W. B., who might pick up a good second-hand press ("Albions" are usually the smallest) for a pound or two. A quarto (12 in. by 10 in.) would, I think, be big enough. Treadle machines would not be suitable, but hand presses up to 36 in. by 23 in. (double demy) will be powerful enough to do what W. W. B. requires. Write to Salmon & Co., Mary's Parsonage, Manchester, for list of second-hand presses, plant, etc., stating your requirements.—J. W. H.

Lucide.—BOTCH.—Camera lucide is no practical use in sketching from nature; it is generally used for copying drawings and such like. It consists of a sheet of plate glass set upright on a board edgewise to the operator, and of any size that may be convenient; the object to be copied is laid down on the board on one side of the glass, and the paper on which it is to be copied on the other; the image will then seem to be reflected on to the paper, and may be readily gone over with a pencil. A modification of this has been made by placing a mirror on one side of the glass to reflect the natural landscape, but the trouble of using it was more than equivalent to the advantages gained.—E. D.

Shut-up Stool.—CLOSE UP.—You say you are a reader of WORK. Allow me to mildly censure you by saying I do not think you are a very attentive one; for in a reply in No. 43, page 684, I have given designs for two forms of stools. From what your friend requires, who, as I understand, is an amateur actor, and whom you say "acts (?) at several places," I should say one of these two would suit him. Pardon me, but I am amused by what somebody called, in reply to Pope's tantalising questions (Pope was deformed), "the little crooked thing that asks questions after acts." You could not have written the letter in your friend's presence, and perhaps you will not be delighted by my quoting it, as he may see it; but, pray, forgive me. It may chance, as you have said "he wants a stool or seat," that you have seen the camp stools but prefer a seat: by this I understand you mean something all wood. So I have designed one for you. You will see by Fig. 3 how it closes. The bottom board is pushed upwards, and one pair of legs folded over the other. Suitable dimensions would be:—height, 16 in.; length, 18 in.; width, 14 in. The top and bottom boards should be about ¾ in. or ⅞ in. thick. The legs must be rather stout. Fig. 7 shows an under view of seat. The right-hand corner blocks must be longer than the left-hand ones, by the thickness of one pair of legs. Each leg is grooved on its inner side as in Fig. 4, and each pair are united towards the bottom by a cross rail, which will support one end of the bottom board. The latter is shaped at each end as in Figs. 5 and 6, small iron pins being driven in where shown; these travel along the grooves, up into the corner blocks, which must also be grooved a little. When the seat is being opened, the bottom board will drop, at the same time pushing open the legs, and it will keep them quite firm. You will find it no difficult matter to fix the hinges, if you will prepare the seat and legs first, and then, turning the seat upside down, place in the bottom board, and put each pair of legs in the position they will occupy when folded.—J. S.

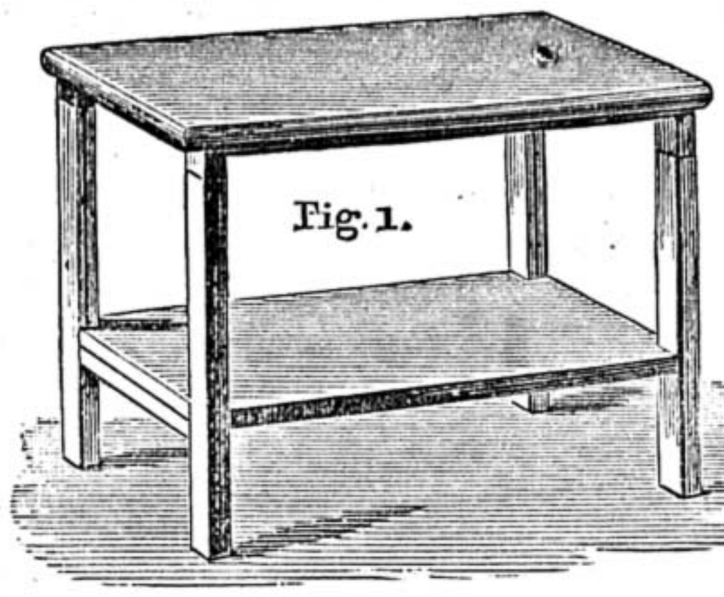

Fig. 1.

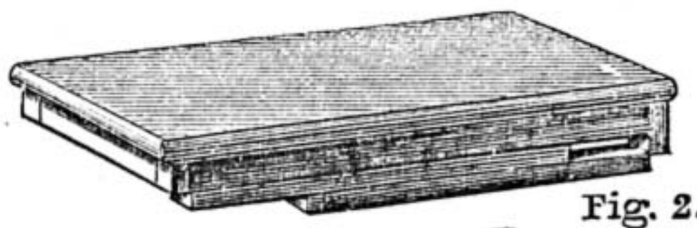

Fig. 2.

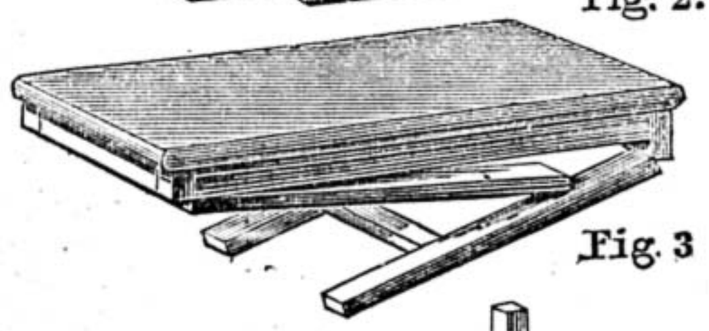

Fig. 3

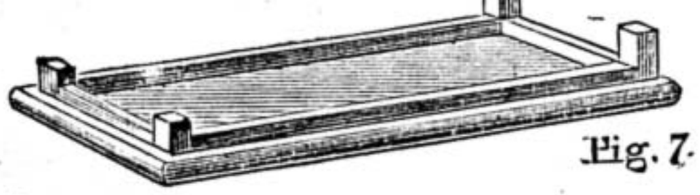

Fig. 7.

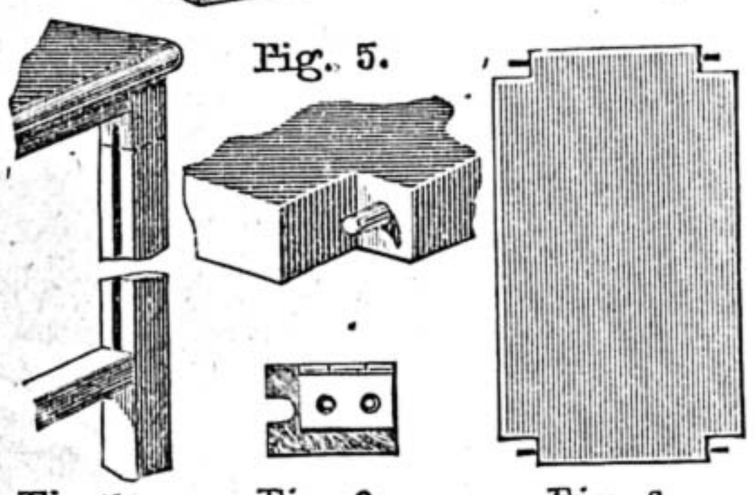

Fig. 5. Fig. 4. Fig. 8. Fig. 6

Shut-up Stool. Fig. 1.—Stool open. Fig. 2.—Stool folded. Fig. 3.—Showing how Stool is folded. Fig. 4.—How to groove each Leg. Fig. 5.—One Corner of Bottom Board. Fig. 6.—Bottom Board. Fig. 7.—Under Side of Bottom Board. Fig. 8.—Section of Leg.

Mouldings, etc.—MIEUX.—You would find what you require if you write or call at the City Frame Co., 29, Basinghall Street, E.C., who keep all kinds of mouldings.—G. R.

Trade Mark.—Z. Z. Z.—The stamped form F, on which the fee of 5s. is payable, is a form of application for registration of a trade mark, and only secures protection so far as it may give a claim to priority. If the Comptroller finds that in his opinion the proposed mark does not clash with any existing trade mark in the same class, the applicant will in due course receive a request to send up a block or electro for advertising in the official journal, that any person who may consider his rights to be infringed by it may enter an objection within a specified time. If no objection be made, the mark will be placed on the register, for which there will be a further fee of £1. This, according to the Act of 1875-77, protects the mark for fourteen years, when, if renewal is desired, the fee will be £2. Mention is made among the definitions of what may be considered to be a trade mark, that the name of an individual or firm (printed, woven, or impressed), a facsimile of a written signature, a distinctive device, heading, label, brand, ticket, or fancy word or words, *not in common use*, are admissible. Z. Z. Z. will see that he can, as he suggests, use his name as a trade mark. A second person similarly named could not, of course, be restricted from trading in his own proper name, but he would be debarred from using the name in such a manner as to be an evident and fraudulent imitation of Z. Z. Z.'s trade mark.—C. C. C.

Dialling.—A. U. F. C. (*Christchurch*) writes:—"I am sure Mr. Yorke will allow me to make a correction in his directions for the use of the sundial. The four days in which the sun is in the meridian at twelve o'clock are:—April 15th, June 15th, August 31st, and December 25th." I have to thank A. U. F. C. for the courteous manner in which he makes this correction. He is right in his emendation.—A. Y.

Enlarging Photographs.—J. L. (*Carlisle*) seems to be confusing photographic enlarging with ordinary drawing. Photographs are not "enlarged in crayons," but finished by this method. Many colourists who devote their attention to the treatment of photographs do this work. For addresses refer to the weekly photographic publications. Pantographs are only used for reducing or enlarging line work.—E. D.

Photo Enlargements.—BROMIDE merely says he fails in getting bromide enlargements, without stating in what the failure consists. The whole process is very easy, and, with ordinary care, there should be no difficulty in securing satisfactory results. A brief statement of the process is this:—The negative to be enlarged is supported at a proper distance in front of the lens; light is transmitted through it by means of a reflector, all other light being shut off except that passing through the negative, the camera being extended to the proper length and the image sharply focussed. The bromide paper is placed in position and the exposure made. Any glass in front of the negative can only be to cause even illumination for the purpose. Ground glass is preferred, but with a reflector this is quite unnecessary.—E. D.

Photographic Materials.—S. W. H. (*Liverpool*).—Hydrokinone developer will keep a moderate length of time, but gradually deteriorates. How long depends on how it is kept. It is always better freshly made, as the action of the air and light tends to its decomposition. The following formula will be found a good one. Make up two solutions; call them A and B.

A solution.

Hydrokinone	.. .. ..	100 grains
Sodium sulphite	.. .. ..	400 ,,
Water	.. .. ..	to 10 oz.

B solution.

Carbonate of potash	.. ..	300 grains
Sodium sulphite	.. .. ..	200 ,,
Water	.. .. ..	to 10 oz.

To use, mix equal parts of A and B, just prior to use. Alum and fix as usual. The lenses mentioned are many of them very excellent; have one on approval. Negative varnish.—12 oz. of best shellac and two ounces of sandrac powdered up coarsely and mixed with sand; ½ gallon of methylated spirit, cold; shake up occasionally during a week or ten days, and filter. Or, white hard spirit varnish, diluted to a proper thickness with methylated spirit. The dark colour of the first preparation is of little consequence for negatives, but may be very much reduced by boiling up in a flask with some fresh animal charcoal and filtering.—E. D.

Prepared Paper for Litho Transfers.—B. J. T. (*Tunstall*) asks me how to prepare paper for lithographic transfers (presumably, from his letter, for ceramic work), with other information as to printing them, etc. Firstly, the design to be transferred should be drawn upon stone, the colour stones prepared in the usual manner, but so arranged that the effect must depend solely upon all opaque colours being printed first and the transparent colours on the top of them, so that the opaque colours show through them where they cross, and by no means by printing opaque colours and transparent colours indiscriminately, so that any opaque colour crosses a transparent one to

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obtain any particular shade or tone. The reason for this is that when the proof is passed just like an ordinary chromo-lithograph, the order of the printing must be inverted—that is, the last printing in the proof must be the first in the transfer, so that when it is transferred and the paper removed, the first printing—viz., that next to the paper—may be on the top whilst all the opaque colours which in the proof were first printed with transparent colours over them (and in the transfer their order being reversed so that the transparent colours will have been printed under the opaque ones) will, after transferring, be over the latter, as in the proof. I advise, moreover, an extra printing in white after the key—that is, in the transfer, the last printing—which transfers all high lights pure white as a ground, to give the effect that the paper of the proof gives, and which possibly the ware would not be purely white enough to give. Indeed, in decorating any but white ware in this manner, and upon glass, white or coloured (except an "opal-flush" glass), it is imperative to print a white last—especially under (*i.e.*, to transfer under) pale yellows and reds, and all the transparent colours where they are pure and do not cross other colours—for the sake of purity of the general colouring. If to be afterwards glazed, your glaze should be principally lead, so as to flux at the lowest possible temperature, or you will destroy the colouring. Therefore, if you are using gold or ceramic colours, they should be kilned and burnt in first—before transferring your lithograph at all—and after the transfer is on the oil should be dried out gradually or it will run in the glazing kiln. I have often thought of attempting to print in ceramic colours, with oil of tar for transfers for ware; but it must be borne in mind that lithography cannot be printed with any pigments that are either chemically certain to affect the carbonate of lime of which stone is composed, or which are not sufficiently fatty to replenish the greasiness of the drawing on stone upon which the whole process depends. Indeed, the writer once had a most interesting conversation with Mr. Robert (who was then director of the manufactory of porcelain at Sèvres, near Paris) on this subject; and his daughter, whose painting on china was marvellously beautiful, seemed to think it could be accomplished. Here is a most interesting subject for B. J. T., or any other reader of WORK, to follow out. I know of no book that gives any good practical instruction as to transfer lithography; but if I supplement the above description by saying that any composition or coating which is soluble in water and is smooth enough to print upon will answer, such as Paris white and size, with or without gum or gamboge (colour does not matter a bit), as all we require is that when the paper is damped, all the printing shall be left adhering to the ware, B. J. T. will, I hope, be able to succeed in the experiment. If not, write again. There is another alternative which strikes me as I write. Why not employ wood blocks for printing such transfers? You would be quite independent of all chemical difficulties; you could use ceramic colours, oil of tar, or any other vehicle; you could obtain much thicker and more solid coats of colour by surface printing, and thus ensure strong work for burning; nay, more: you could follow out the ordinary manner of china painting by frequent kilning—burning in those colours first that require the greatest heat, subsequently those requiring less, and even a third burning in of those which require a minimum of heat, by making three transfers from the same key instead of one only. The "register," as it is technically termed—that is, the exact fitting of one transfer over another—could be readily obtained with needles fitting into minute holes in the ware at points fixed beforehand. If B. J. T. decides to enter into a course of experiments in this direction, with our Editor's permission I will put myself into private communication with him, and promise to assist him so far as designing and engraving the required blocks are concerned, and the printing of the transfers free of cost if he will do the rest.—J. W. H.

Walnut Spirit Stain.—AMATEUR.—I do not know, and you do not say, for what purpose you want the stain, or whether you merely want a dark polish or varnish which will enable you to dispense with previous staining. I shall assume this, as, if you only want a spirit stain, I must know something more before I can advise you. To darken the polish or varnish, mix some vandyke brown with it. Mind, a coloured varnish does not colour the wood itself, but merely coats it, so that if the varnish gets chipped off an uncoloured patch may show.—D. D.

Engine to Drive Dynamo.—H. G. B. (*New Cross*).—The small dynamo supplied by Mr. Bottone is merely a pretty little model machine that will go easily into one's pocket. The most suitable engine to drive this will be a model steam engine. Next to this in point of suitability would be a small gas engine. As you are favourably situated to obtain good and cheap gas, you would find a gas engine less costly than an oil engine. These are mere novelties of which I know next to nothing.—G. E. B.

Granule Carbon Battery.—W. J. P. (*Portslade*).—The granule carbon battery is merely a double fluid bichromate battery. There is much fiction in the report of this battery as quoted by you. No bichromate battery of 5 cells, each 8 in. by 5 in., will furnish enough current to light up a 5 c.p. lamp for forty hours with one charge of solution. Then as to cost of solution. The bichromate of potash itself will cost at least two shillings, and this will only last for twelve hours. I have had considerable experience with this battery, but have not time just now to write an account of it.—G. E. B.

Armature Windings.—F. W. C. (*Stratford*).—I do not see any advantage in having four or more sectors on the commutator to an H girder armature. Two sectors are enough for such a small armature (6½ in. by 2½ in.). Wind the wire along closely side by side until the spindle is reached, then pass it on the other side of the spindle. Full instructions will be given in an article on the Siemens dynamo in the series of articles on "Model Electric Lights."—G. E. B.

IV.—QUESTION ANSWERED BY A CORRESPONDENT.

Pocket Lamp.—A. J. (*Faversham*) writes in reply to W. G. H. (*St. German's*) (see No. 64, page 191, Vol. II.):—"At the invitation of the Editor I send you sketches and description of a small pocket lamp I bought over twenty years ago. Although it does not exactly correspond to the description given by you, you and others may be interested in it. It is made entirely of brass, and oval in shape, and the sketches are full size. A is lamp; B, cover to pull off; C, lamp with cover removed, showing wick and percussion cap holder G and H respectively; D shows base with hinged flap F, and

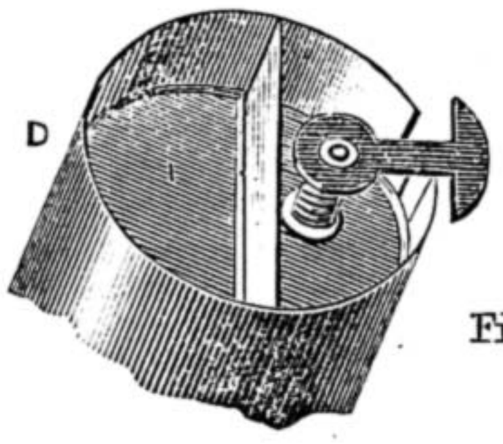

Fig. 1.

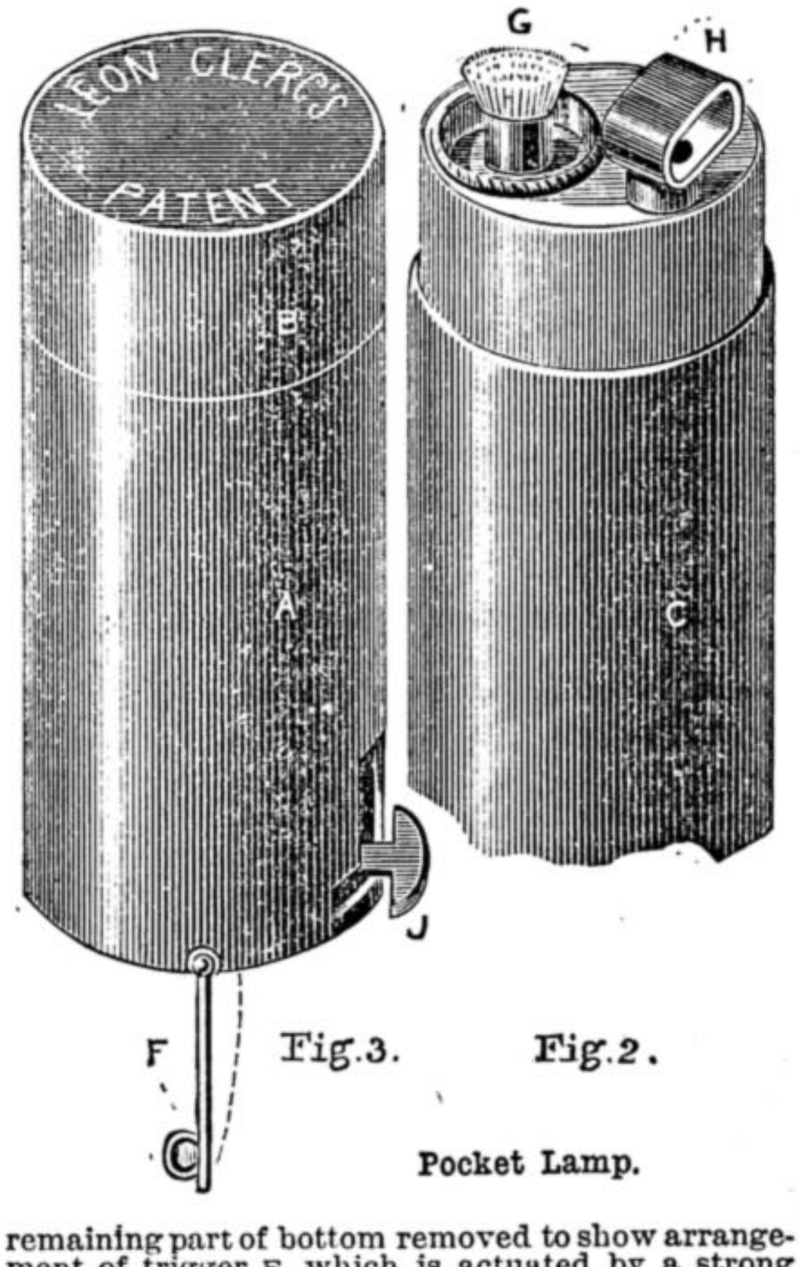

Fig. 3. Fig. 2.

Pocket Lamp.

remaining part of bottom removed to show arrangement of trigger E, which is actuated by a strong spiral spring concealed within the body of the lamp. A reserve for percussion caps is shown at I. In use the lamp is filled with spirits of wine or benzoline, and a percussion cap placed in the receptacle H. On releasing the trigger J from the bayonet slot, the spiral spring draws the trigger and plunger forcibly up into H, explodes the cap, and lights the lamp. The caps are similar to those used for toy pistols."

V.—BRIEF ACKNOWLEDGMENTS.

Questions have been received from the following correspondents, and answers only await space in SHOP, upon which there is great pressure:—TRIMMER (*Cork*); C. E. M. (*Birkenhead*); W. J. T. (*Gateshead-on-Tyne*); A. T. V. (*London, E.*); G. F. S. (*Camberwell*); F. McG. (*Sheffield*); W. D. (*Bath*); R. W. N. (*Islington*); G. T. (*Clapham Junction*); T. N. (*Newtown*); T. H. W. (*Sowerby Bridge*); E. J. W. (*Camp Hill*); D. N. (*Eastbourne*); S. E. (*Camberwell*); R. A. (*Islington*); W. W. T. (*Leeds*); IMPROVER; A. C. (*Frome*); J. T. C. (*Hull*); J. T. (*London*); G. J. A. (*Birmingham*); T. W. (*Hackney*); A. F. (*London, S.W.*); D. J. C. (*London, E.*); J. M. (*Dundalk*); J. H. E. (*London, W.*); J. L. & Co. (*Birmingham*); A. R. (*Scorrier*); W. H. W. (*Leyton*); W. F. (*London, S.W.*); W. V. (*Birmingham*); CAMANALISH; R. W. (*Ruspidge*); C. W. (*Kensington, W.*); B. A. B. (*Hampstead*); J. B. F. (*Brixton*); H. J. B. (*Cirencester*); J. M. (*Midhurst*); E. M. (*Peterhead*); APPRECIATING SUBSCRIBER; G. H. (*Birmingham*); E. G. (*Sheffield*); MEMO A.; H. J. A. (*Dover*); J. McK. (*Lisburn*); F. H. (*Streatham*); C. W. B. (*Plymouth*); J. W. D. (*Manchester*); A. E. R. (*Manchester*); F. H. B. (*Liverpool*); J. D. C. (*Brighton*); R. D. (*London, E.*); F. C. H. (*London, S.E.*); WOULD-BE PHOTOGRAPHER; P. F. Z. (*Hammersmith*); W. L. (*London, N.E.*); G. D. (*Epping*); LOCO; G. J. (*Weybridge*); ELECTRICIAN; H. A. M. (*London, E.C.*); H. C. (*London, S.W.*); A. C. (*Birmingham*); W. G. O. (*Manchester*); A. J. P. (*Westminster*); F. R. H. (*Andover*); W. MCA. (*Cockermouth*); P. H. (*Streatham Hill*); J. H. W. (*Leytonstone*); R. M. (*London, S.W.*); SCOT; A. M. L. (*Duncason*); F. J. W. (*Ipswich*); A. S. (*Fulham, S.W.*); J. P. (*New North Road, N.*); H. S. (*Rencar*); A. E. (*Hampstead, N.W.*); J. B. (*Hoxton, N.*); J. P. L. (*Stepney, E.*); W. G. B. (*Bermondsey, S.E.*).

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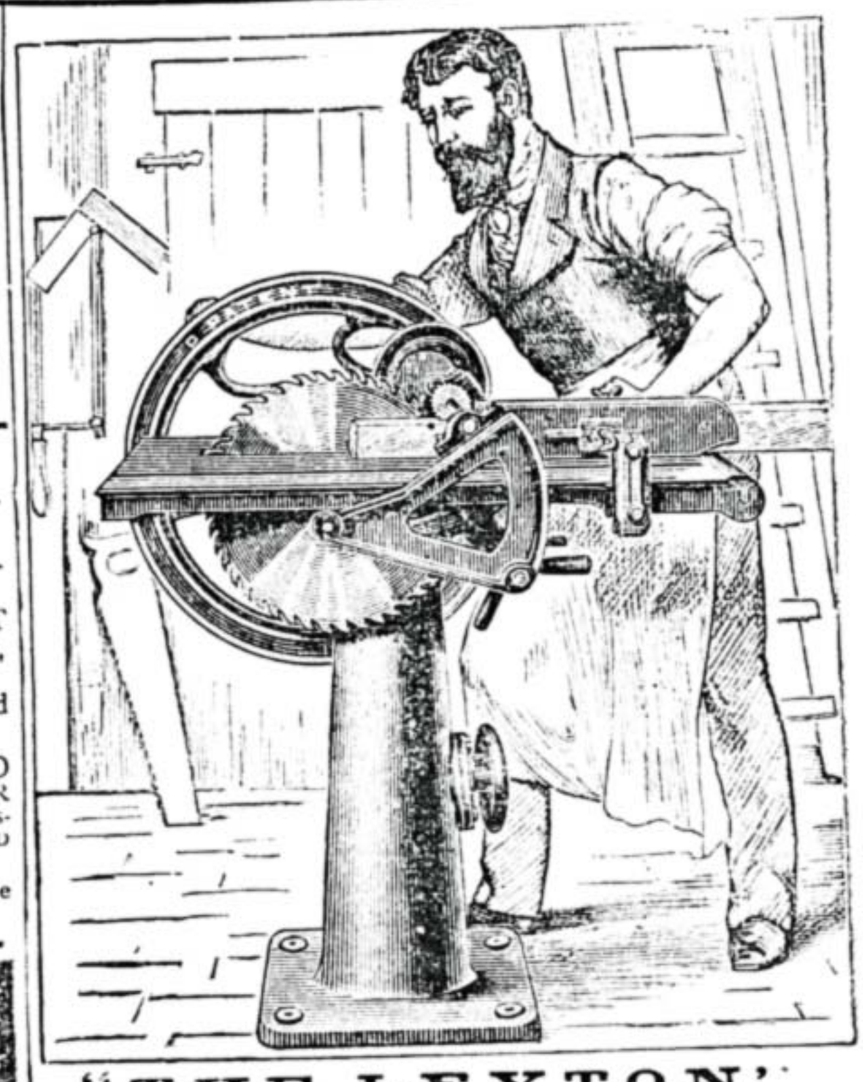

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